Stormwater Management and Erosion Control Report and Hydrologic and Hydraulic Study

Site Location: 70 Craigie Street
Somerville, Massachusetts

Prepared for: Boyes Watson Architects
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Prepared by: Lenard Engineering, Inc.
19 Midstate Drive
Suite 200
Auburn, MA 01501

DRAFT

Date: November 30, 2015

Note: A copy of this report must be kept on site at all times.

REPORT SUMMARY:

Calculation Objectives:

The objective of these calculations is to provide pre and post development drainage calculations as provided for in the Massachusetts Stormwater Management Standards

Calculation Methods:

TR55/TR20 methodology utilizing HydroCAD software by Applied Microcomputer Systems.

Sources of Data:

Technical Report No. 20

Technical Report No. 55 and the Massachusetts Supplement for TR-55

Technical Paper No. 40

Field Survey by Medford Survey

"Middlesex County, Massachusetts" by the Natural Resources Conservation Service (NRCS).

"Massachusetts Stormwater Handbook" – Revised February 2008, by the Massachusetts Department of Environmental Protection (MADEP)

Selection of Storm Events:

The storm events have been taken from the Technical Paper 40 Design Storms for Middlesex County. The rainfall data for the Type III, 24-hour storm events is as follow:

Frequency (Years)	Rainfall (Inches)
2	3.1
10	4.5
25	5.3
50	5.9
100	6.5

The time of concentration (Tc) for each watershed was calculated utilizing SCS TR-55 and the Massachusetts supplement. If the calculated Tc resulted in a time of less than 0.1 hours (6 minutes), then a direct entry of 6 minutes was used in the calculations.

Project Narrative

EXISTING SITE DESCRIPTION

Lenard Engineering, Inc. (LEI) has been retained by Boyes Watson Architects to prepare a Stormwater Management Plan in accordance with the City of Somerville and Massachusetts Stormwater Management requirements. The plan is for the site associated with 70 Craigie Street in Somerville, MA. The proposed site plan includes partial demolition and a subsequent addition of an existing three unit residential structure. The Stormwater Management will be implemented on the site to the maximum extent practicable. The total parcel area and land disturbance area is approximately 9,984 ft^2.

EXISTING SITE HYDROLOGY

The entire site is located in the Charles River Watershed. The parcel has one drainage area in the existing condition. The existing condition has a total area of 9,984 ft^2, 5,967 ft^2 of which is impervious. Soil Maps indicate a Newport soil that falls under hydrologic soil group D. This fine sandy loam material is assumed to have hydraulic conductivity of 0.01 to 0.20 inches per hour. A rate of 0.09 inches per hour was utilized in the calculations based on the Rawls Rates taken from the Massachusetts Stormwater Management Standards.

PROPOSED SITE HYDROLOGY

The proposed site condition has a total area of 9,984 ft^2, 6,522 ft^2 of which is impervious. The driveways and walkways will remain impervious cement concrete or bituminous concrete and the remaining area will be grass or planting areas. The parcel is broken down into four sub catchment drainage areas. The first sub catchment includes all areas that will drain out to Craigie Street or the same as in the existing conditions. This area includes existing concrete driveways and walkways, rooftop draining to the driveway and out to Craigie Street and all other pervious areas that will either be grass or planting areas that will be drained away from buildings and abutting properties. A stone drainage trench will be installed to alleviate low flows from the driveway prior to flowing to abutting properties. The second area includes rooftop runoff for the building addition which will drain to a precast concrete drywell with an overflow drain with splash blocks in case of blockages or surcharge conditions. The third area includes a stairway drain that will catch any flow though a small drain inlet to prevent from entering the building. This drain will flow to the drywell located in the rear of the property. The fourth subcatchment includes a small stair drain and a portion of the of the existing roof. This area will drain to a small drywell and will also be equipped with an overflow with splash block.

ANALYSIS SUMMARY

The two drywells and stone trench drain will manage runoff and recharge to groundwater as the soil to reduce runoff from the site. Soil conditions are assumed to be Hydrologic Soil Group D based on soil maps. However, test pits have not been done, but are required to confirm conditions prior to construction.

The construction entrance will be protected with an anti-tracking pad (if soil is exposed I the driveway only) in order to prevent tracking of earthen materials from trucks onto the public way. The construction entrance will be graded into the site which will prevent sediment runoff from entering the City streets and right-of-ways. The site will be protected with haybales at the construction entrances and an orange construction fence at the perimeter of the property.

Hydrologic Summary

Standard #1: Untreated Stormwater

This project does not discharge untreated contaminated stormwater into or cause erosion to wetlands.

Standard #2: Existing Conditions and Proposed Conditions Flow with Infiltration/Detention

	Existing site (cfs)	Proposed site (cfs)
2-yr	0.56	0.49
10-yr	0.89	0.78
25-yr	1.07	0.94
50-yr	1.21	1.07
100-yr	1.35	1.19

Standard #3: Recharge to Groundwater

Existing Impervious Area=5,967 square feet

Proposed Impervious Area=6,522 square feet

Net Increase=6,522-5,967=555 square feet

Recharge Required

$(R)_r = I_b * 0.1$" (Hydrologic Soil Group D)
$(R)_r =$ 555 ft^3 x 0.1"/12=4.64 ft^3

Recharge Provided

(1) 6 foot diameter x 6 foot deep drywells @ 170 ft^3 each = 170 ft^3

(1) 4 foot diameter x 4 foot deep drywells @ 50.3 ft^3 each = 50.3 ft^3

Standard 8: Operations & Maintenance Plan During Construction

1. **Responsibility Party for Stormwater Management Operation and Maintenance:**

   The responsible party for performance of stormwater management operations and maintenance during the construction phase of this project shall be the property owner. At the time of this application the property owner is:

   Mark Boyes Watson
   30 Bow Street
   Somerville, MA 02143

   In the event ownership is conveyed to another entity, said entity shall assume responsibility for performance of stormwater management operations and maintenance during the construction phase of this project.

   The responsible party may task the work to a contractor, consultant, or other entity. This does not relieve the responsible party from conformance with the requirements outlined herein.

2. **Schedule of Inspection and Maintenance:**

   A. Ground cover shall be maintained to the maximum extent practicable. Clearing of site covering shall be phased in manner to minimize the amount of destabilized soils at any one time. Permanent ground cover shall be placed as soon as feasible in areas where construction is complete.

   B. Temporary soil stabilization shall be used during construction in disturbed areas susceptible to erosion. Dust control will be maintained through the use of calcium chloride.

   C. Surface waters will be intercepted and diverted away from excavations.

   D. Grading will be performed so as not to divert water onto properties adjoining the site.

   E. All site pavement shall remain in-place until time of phased excavation; at which time removal shall be limited to immediate area of excavation.

3. **Compliance:**

   This Plan and all completed Inspection and Maintenance Report Forms shall be kept on-site and be available for review.

   Compliance with the requirements of this plan is mandatory.

STORM WATER POLLUTION PREVENTION PLAN

FOR DURING CONSTRUCTION ACTIVITIES

INSPECTION AND MAINTENANCE REPORT FORM

TO BE COMPLETED EVERY 7 DAYS AND WITHIN 24 HOURS AFTER
A RAINFALL EVENT OF 0.5 INCHES OR MORE

Name and Title of Inspector:_____
Date of Inspection:_____ Purpose of Inspection: _____

Days Since Last Rainfall:____ Amount of Last Rainfall:____ inches

Associated Site Activities:_____
_____

Observations:

-Are erosion and sediment controls operating properly, without potential for pollutant entering runoff?_____

-Other Observations: _____
_____

Maintenance Required:
_____
_____

To Be Performed By: _____ On or Before:_____

For inspections with no incidence of noncompliance, the inspector's signature is required affirming the following: "I certify that the **70 Craigie Street** sites are in compliance with the requirement of the Stormwater Management Plan and the City of Somerville requirements.

_____ _____
Signature Date

Erosion and Sedimentation Control Inspection Log			
Date of Inspection	**Inspector**	**BMP Inspected**	**Maintenance Required**

Standard 9: Permanent Operations & Maintenance Plan

1. **Responsibility Party for Stormwater Management Operation and Maintenance:**

   The responsible party for performance of stormwater management operations and maintenance shall be the property owner. At the time of this application the property owner is:

   Mark Boyes Watson
   30 Bow Street
   Somerville, MA 02143

   In the event ownership is conveyed to another entity, said entity shall assume responsibility for performance of stormwater management operations and maintenance during the construction phase of this project. For example, a joint ownership association created upon the recording of condominium deed documentation would become the responsible party at the time of recording.

   The responsible party may task the work to a contractor, consultant, or other entity. This does not relieve the responsible party from conformance with the requirements outlined herein.

2. **Schedule of Inspection and Maintenance:**

   A. All parking areas will be swept annually at the start of each spring.

   B. Drywells will be inspected annually in conjunction with the spring street sweeping operation for required stormwater devices with a power vacuum, a mechanical clamshell shovel, by hand or equal. All debris/sediment within 12 inches of the invert shall be removed at the time of inspection or annually at a minimum.

   C. The top 6-inches and filter fabric shall be inspected annually. All sand, debris, trach or other material shall be removed. The stone above the filter fabric shall be replaced as necessary in order to allow water to pass through the stone unimpeded by fine sediment or other material.

   D. Debris found at the time of inspection will be removed and properly disposed. Debris shall include sediment trash and other pollutants.

3. **Compliance:**

   This Plan and all completed Inspection and Maintenance Report Forms shall be kept on-site and be available for review.

   Compliance with the requirements of this plan is mandatory.

STORM WATER POLLUTION PREVENTION PLAN
FOR DURING FACILITY OPERATIONS

INSPECTION AND MAINTENANCE REPORT FORM

TO BE COMPLETED AT THE TIME OF EACH INSPECTION AND/OR MAINTENANCE OPERATION

Name and Title of Inspector:_____

Date of Inspection:_____ Purpose of Inspection: _____

Observations:

-Condition of Stormwater Facilities:_____
_____

-Other Observations: _____
_____

Maintenance Performed:

Include type of maintenance (sweeping, structure cleaning, grate clearing, etc...) approximate quantity of materials removed, and disposition of material.

_____
_____
_____
_____
_____
_____

For inspections with no incidence of noncompliance, the inspector's signature is required affirming the following: "I certify that the **70 Craigie Street** sites are in compliance with the requirement of the Stormwater Management Plan and the City of Somerville requirements.

_____ _____
Signature Date

Stormwater Inspection Log			
Date of Inspection	**Inspector**	**BMP Inspected**	**Maintenance Required**

Spill Prevention and Control Practices

Spill Prevention and Control Practices

For Practices not more specifically addressed by federal, state and local laws and implementing regulations or other requirements, all spills will be managed in accordance with the Oil and Hazardous Materials Management and Spill Control Program presented in this report.

The following practices will be followed onsite during the construction project for spill prevention and cleanup:

1. Spills of oil or hazardous material will be reported by the Contractor to the appropriate federal and/or state agency, if the reportable quantity is exceeded. All spills of OHM, in any quantity will be reported to the Authority.
2. Materials, equipment and procedures necessary for spill cleanup will be kept in chemical storage area(s) onsite. Where equipment such as backhoes and bulldozers will be working, materials for spill containment will be kept accessible. Site personnel will be made aware of appropriate spill cleanup procedures and the location of this information and cleanup supplies.
3. All spills will be cleaned up immediately after discovery. Leaks, drips and other spills will be cleaned using minimal practical amounts of water. The spill area will b kept ventilated and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
4. A spill report will be prepared following each occurrence. The spill report will identify nature of spill, including quantity and type of material, date of spill, circumstances leading to release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence. Such reports will be maintained as an added appendix to this report by the Contractor.
5. An appropriately trained site employee involved with day-today site operations will be identified to be the spill prevention and cleanup coordinator. The name(s) of responsible spill personnel will be posted in the material storage area and in the office trailer onsite. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator designated by the Contractor.

Soil Maps

United States Department of Agriculture

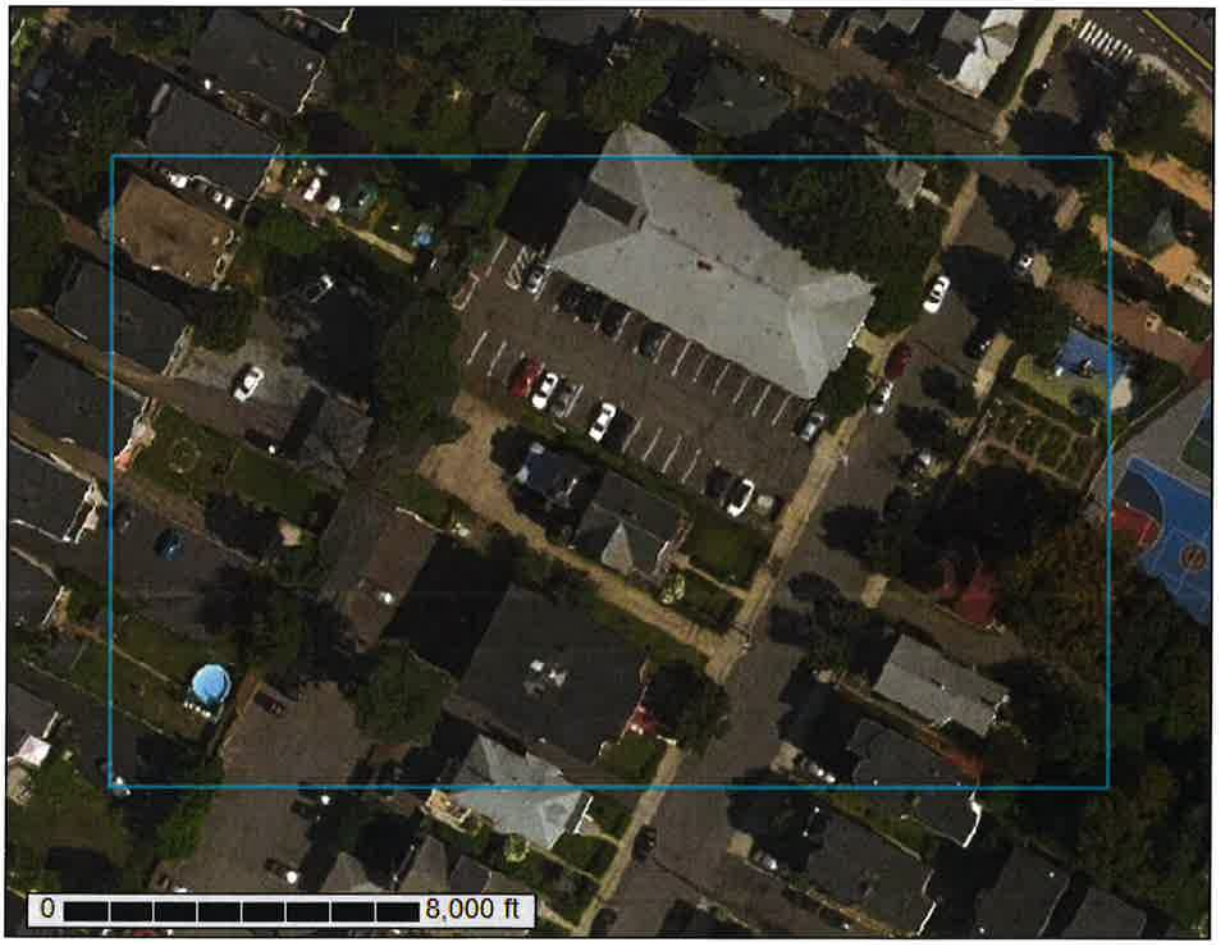
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Middlesex County, Massachusetts

70 Craigie Street Somerville, MA



November 17, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 15, Sep 28, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
627C	Newport-Urban land complex, 3 to 15 percent slopes	2.5	100.0%
Totals for Area of Interest		**2.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

627C—Newport-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9958
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Newport and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newport

Setting

Landform: Ridges, moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy basal till over dense loamy lodgment till derived from phyllite

Typical profile

H1 - 0 to 8 inches: channery fine sandy loam
H2 - 8 to 18 inches: channery silt loam
H3 - 18 to 24 inches: channery sandy loam
H4 - 24 to 65 inches: channery fine sandy loam

Properties and qualities

Slope: 8 to 20 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Udorthents, loamy
Percent of map unit: 10 percent

Pittstown
Percent of map unit: 3 percent
Landform: Depressions, drumlins
Landform position (two-dimensional): Shoulder, backslope, toeslope
Landform position (three-dimensional): Base slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Concave

Paxton
Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex

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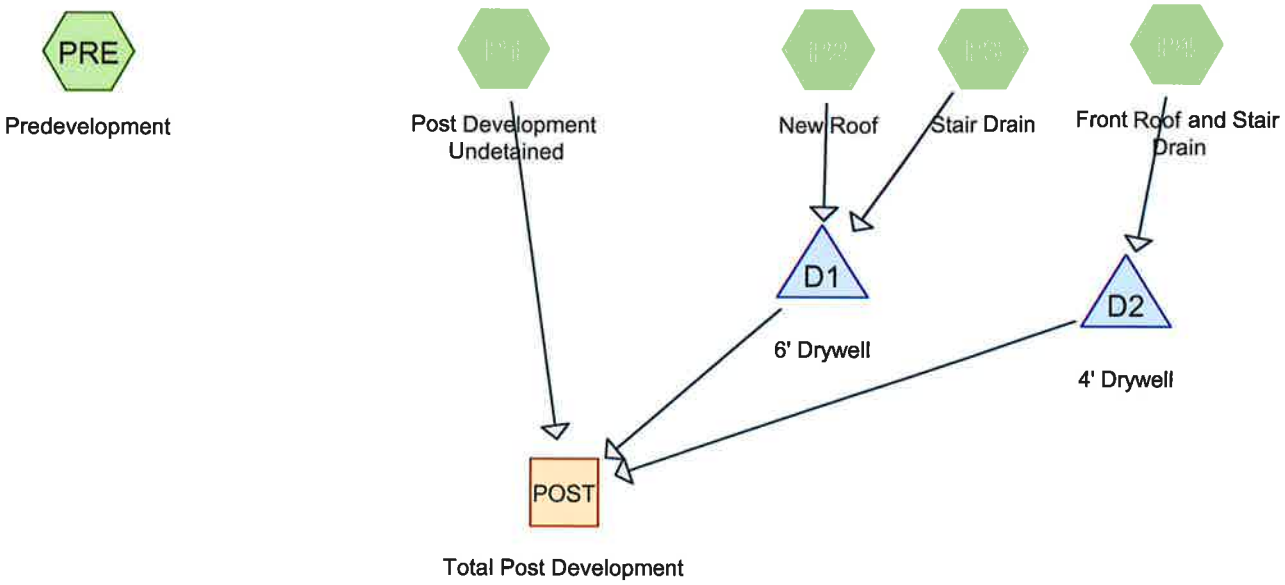
Hydrologic Calculations



Subcat Reach Pond Link

Drainage Diagram for 70 Craigie
Prepared by Microsoft, Printed 11/30/2015
HydroCAD® 9.10 s/n 00505 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.172	80	>75% Grass cover, Good, HSG D (P1, PRE)
0.150	98	Impervious (P1, P2, P3, P4)
0.137	98	Impervious Area (PRE)
0.458		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.172	HSG D	P1, PRE
0.287	Other	P1, P2, P3, P4, PRE
0.458		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Post Development Runoff Area=8,814 sf 60.71% Impervious Runoff Depth>2.04"
Tc=6.0 min CN=91 Runoff=0.49 cfs 0.034 af

Subcatchment P2: New Roof Runoff Area=621 sf 100.00% Impervious Runoff Depth>2.68"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.003 af

Subcatchment P3: Stair Drain Runoff Area=50 sf 100.00% Impervious Runoff Depth>2.68"
Tc=6.0 min CN=98 Runoff=0.00 cfs 0.000 af

Subcatchment P4: Front Roof and Stair Runoff Area=500 sf 100.00% Impervious Runoff Depth>2.68"
Tc=6.0 min CN=98 Runoff=0.03 cfs 0.003 af

Subcatchment PRE: Predevelopment Runoff Area=9,984 sf 59.77% Impervious Runoff Depth>2.04"
Tc=6.0 min CN=91 Runoff=0.56 cfs 0.039 af

Reach POST: Total Post Development Inflow=0.49 cfs 0.034 af
Outflow=0.49 cfs 0.034 af

Pond D1: 6' Drywell Peak Elev=3.56' Storage=0.003 af Inflow=0.05 cfs 0.003 af
Outflow=0.00 cfs 0.000 af

Pond D2: 4' Drywell Peak Elev=89.46' Storage=0.002 af Inflow=0.03 cfs 0.003 af
Outflow=0.00 cfs 0.001 af

Total Runoff Area = 0.458 ac Runoff Volume = 0.079 af Average Runoff Depth = 2.08"
37.46% Pervious = 0.172 ac 62.54% Impervious = 0.287 ac

Summary for Subcatchment P1: Post Development Undetained

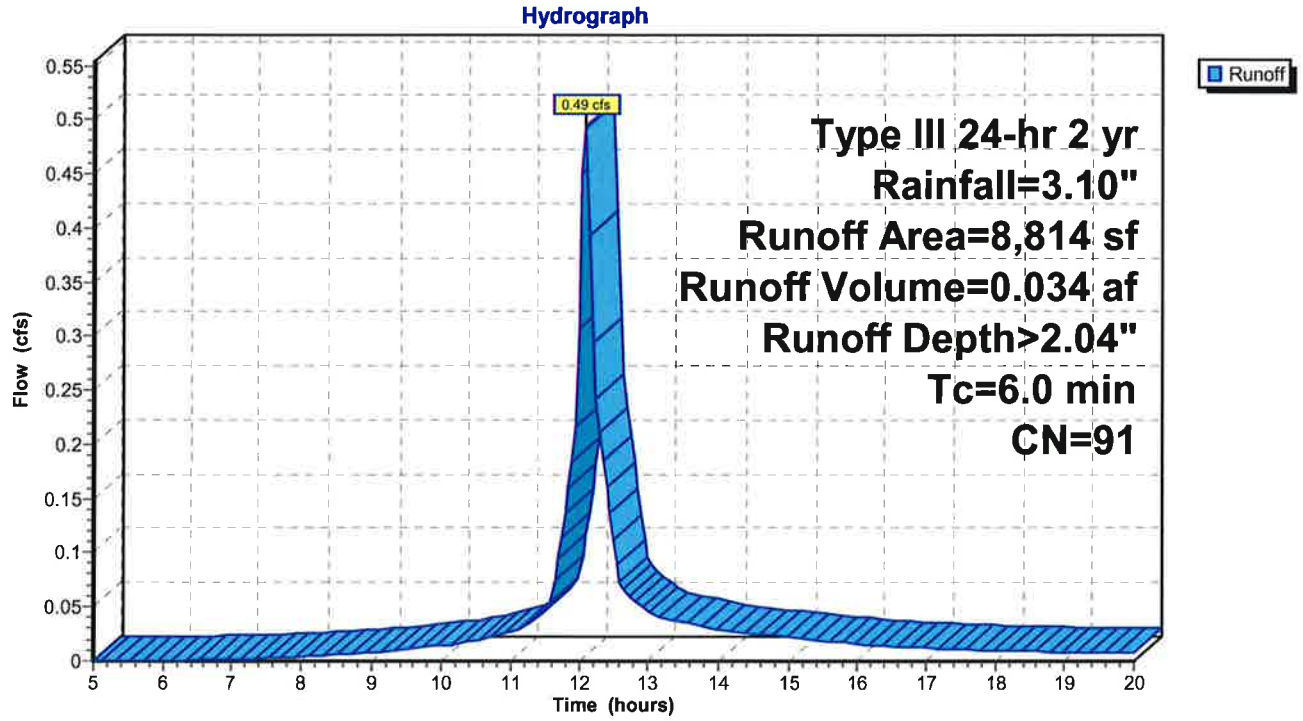
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 0.034 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

	Area (sf)	CN	Description
	3,463	80	>75% Grass cover, Good, HSG D
*	5,351	98	Impervious
	8,814	91	Weighted Average
	3,463		39.29% Pervious Area
	5,351		60.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P1: Post Development Undetained



Summary for Subcatchment P2: New Roof

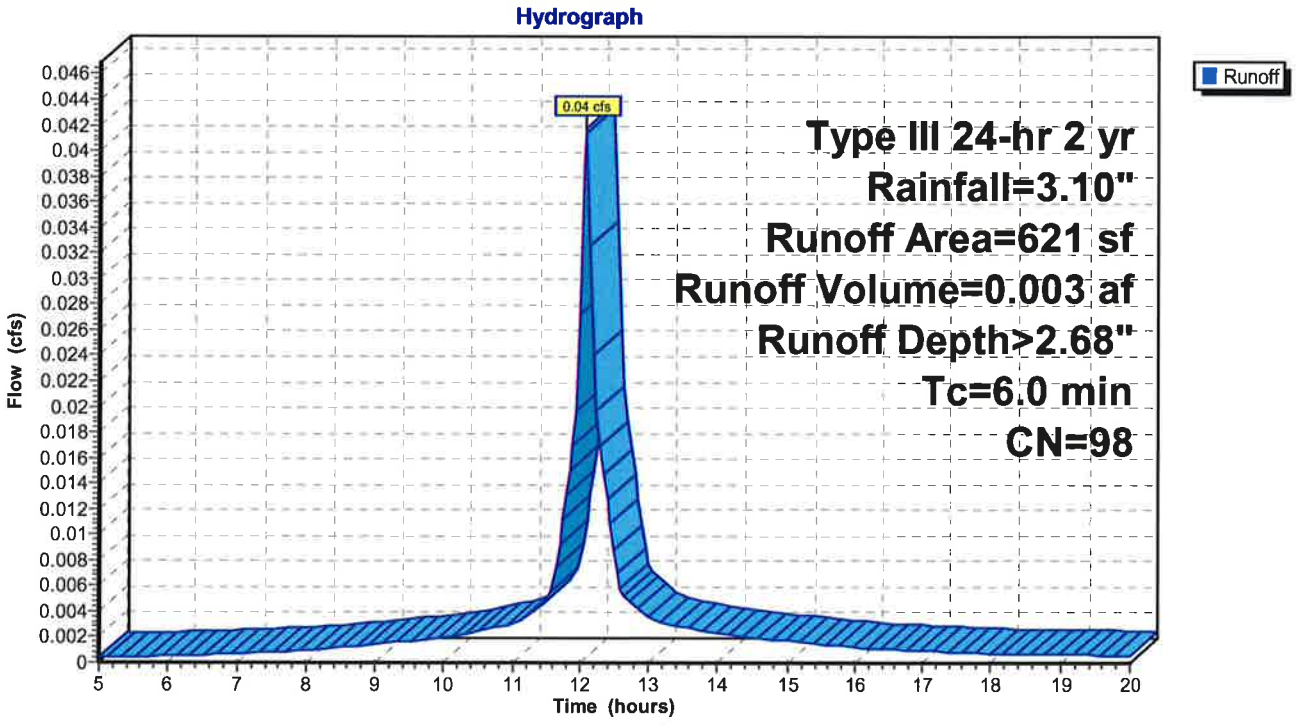
Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

	Area (sf)	CN	Description
*	621	98	Impervious
	621		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P2: New Roof



Summary for Subcatchment P3: Stair Drain

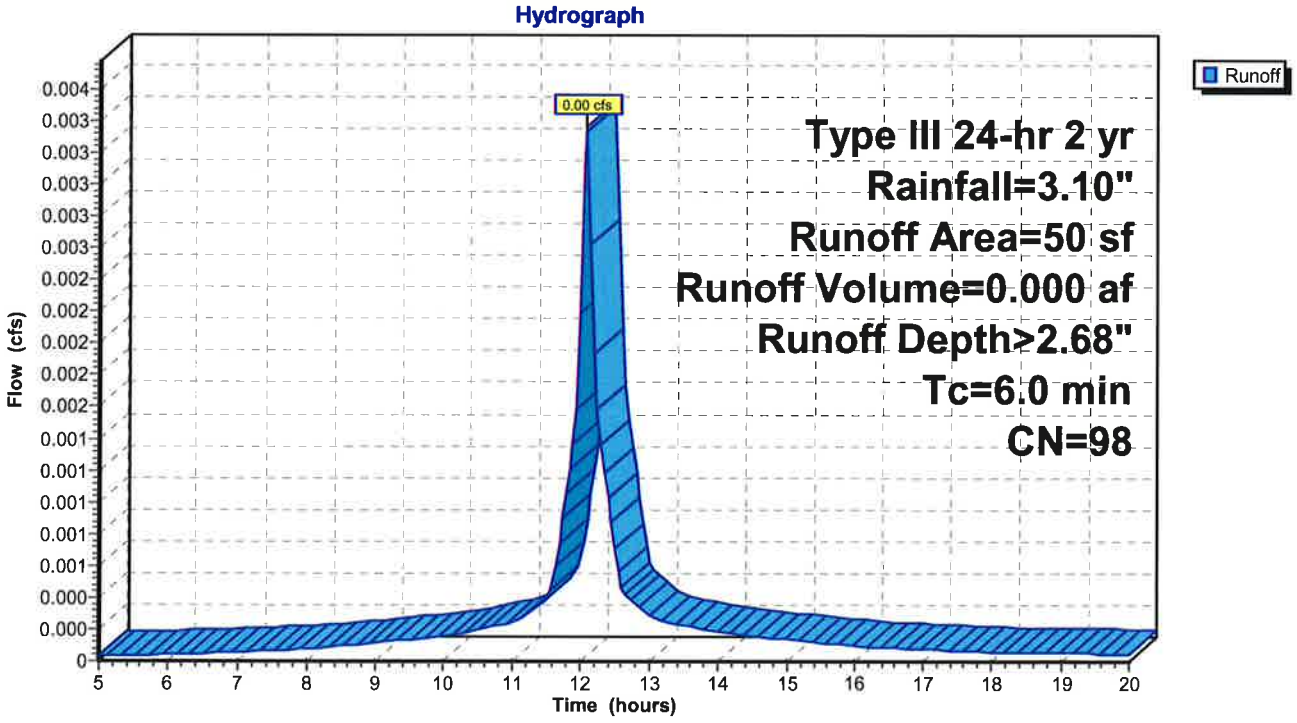
Runoff = 0.00 cfs @ 12.09 hrs, Volume= 0.000 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

	Area (sf)	CN	Description
*	50	98	Impervious
	50		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P3: Stair Drain



Summary for Subcatchment P4: Front Roof and Stair Drain

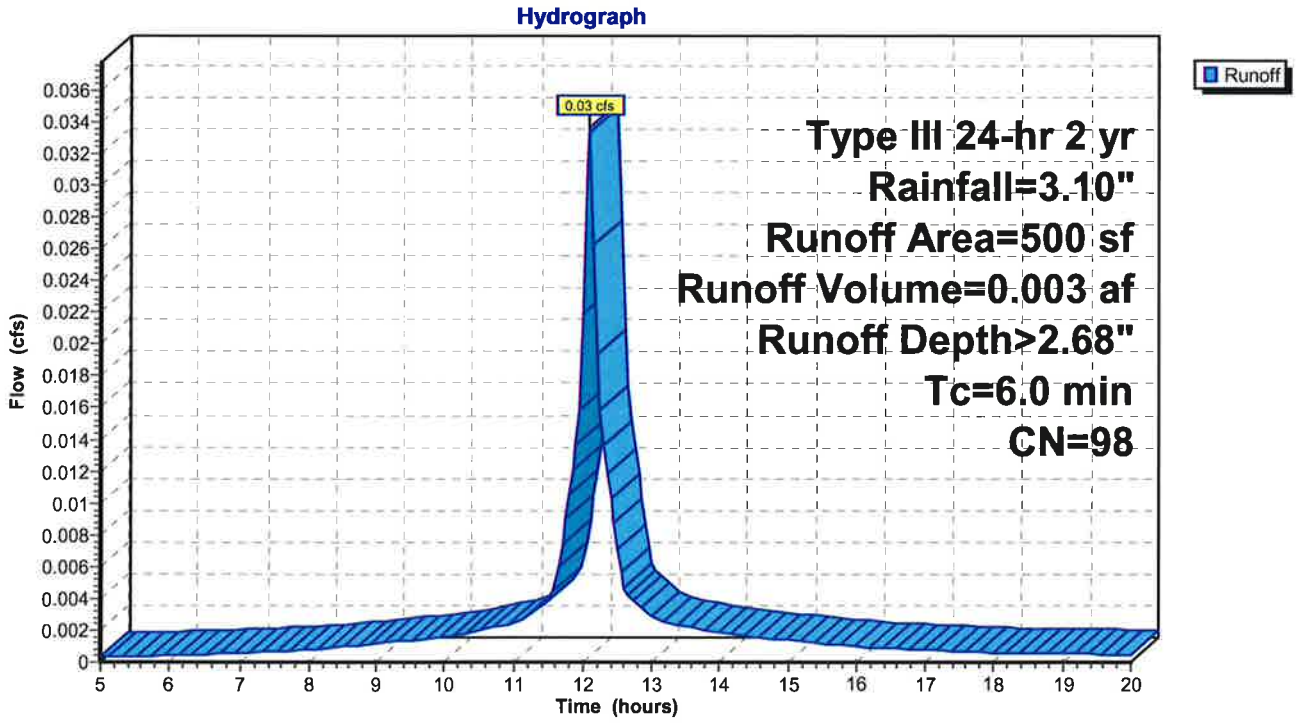
Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

	Area (sf)	CN	Description
*	500	98	Impervious
	500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P4: Front Roof and Stair Drain



Summary for Subcatchment PRE: Predevelopment

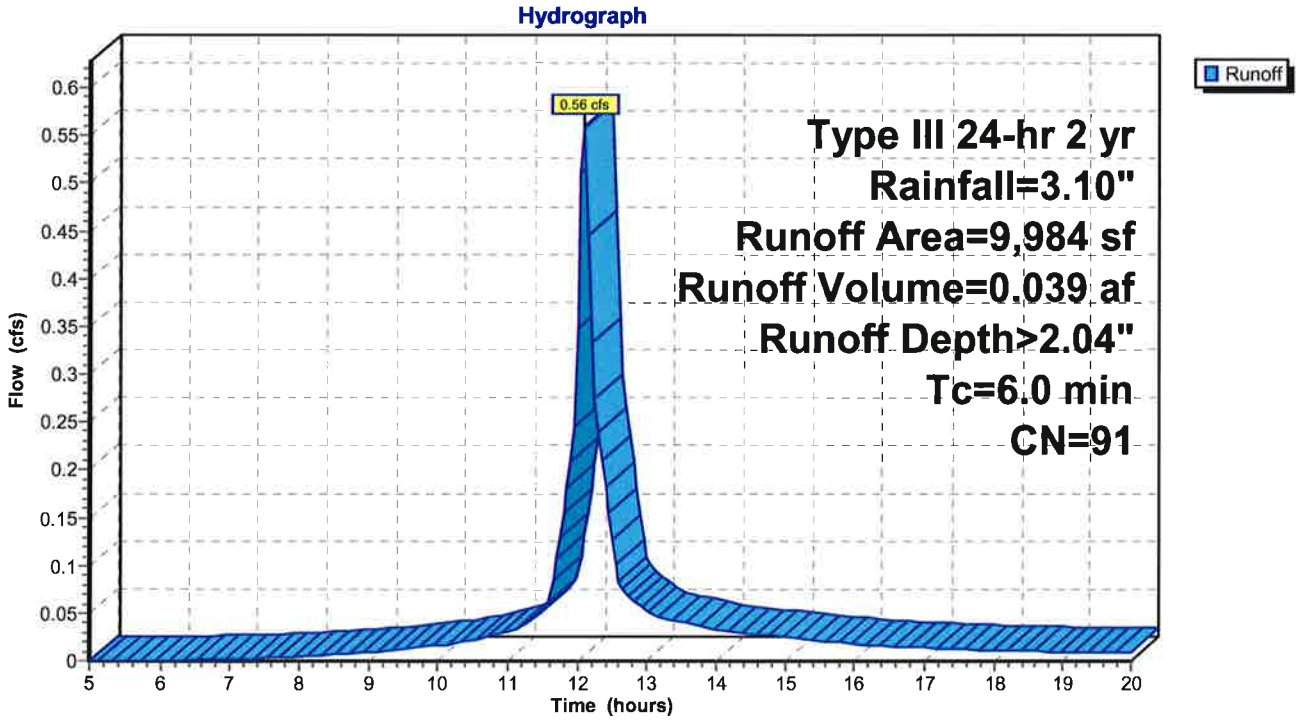
Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.039 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

	Area (sf)	CN	Description
*	5,967	98	Impervious Area
	4,017	80	>75% Grass cover, Good, HSG D
	9,984	91	Weighted Average
	4,017		40.23% Pervious Area
	5,967		59.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment PRE: Predevelopment



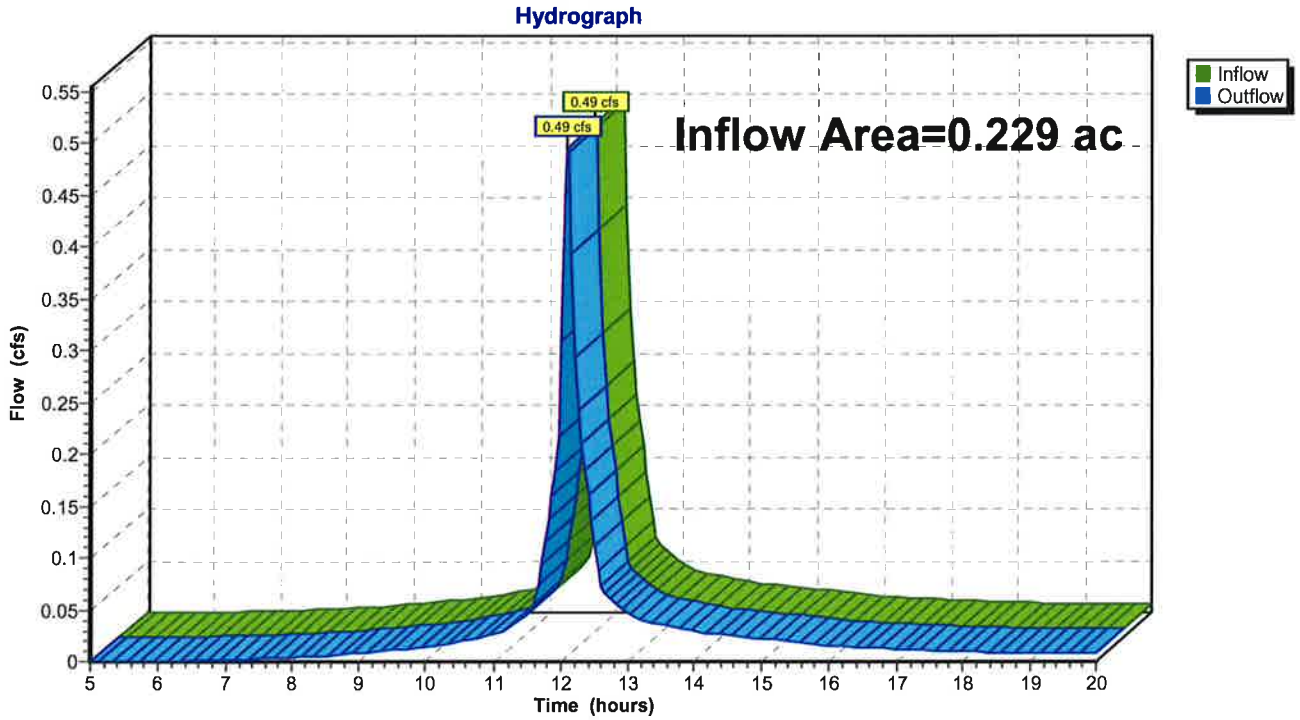
Summary for Reach POST: Total Post Development

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.229 ac, 65.32% Impervious, Inflow Depth > 1.80" for 2 yr event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 0.034 af
Outflow = 0.49 cfs @ 12.09 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach POST: Total Post Development



Summary for Pond D1: 6' Drywell

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth > 2.68" for 2 yr event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 99%, Lag= 474.8 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.56' @ 20.00 hrs Surf.Area= 0.001 ac Storage= 0.003 af

Plug-Flow detention time= 414.8 min calculated for 0.000 af (8% of inflow)
Center-of-Mass det. time= 122.7 min (861.6 - 738.9)

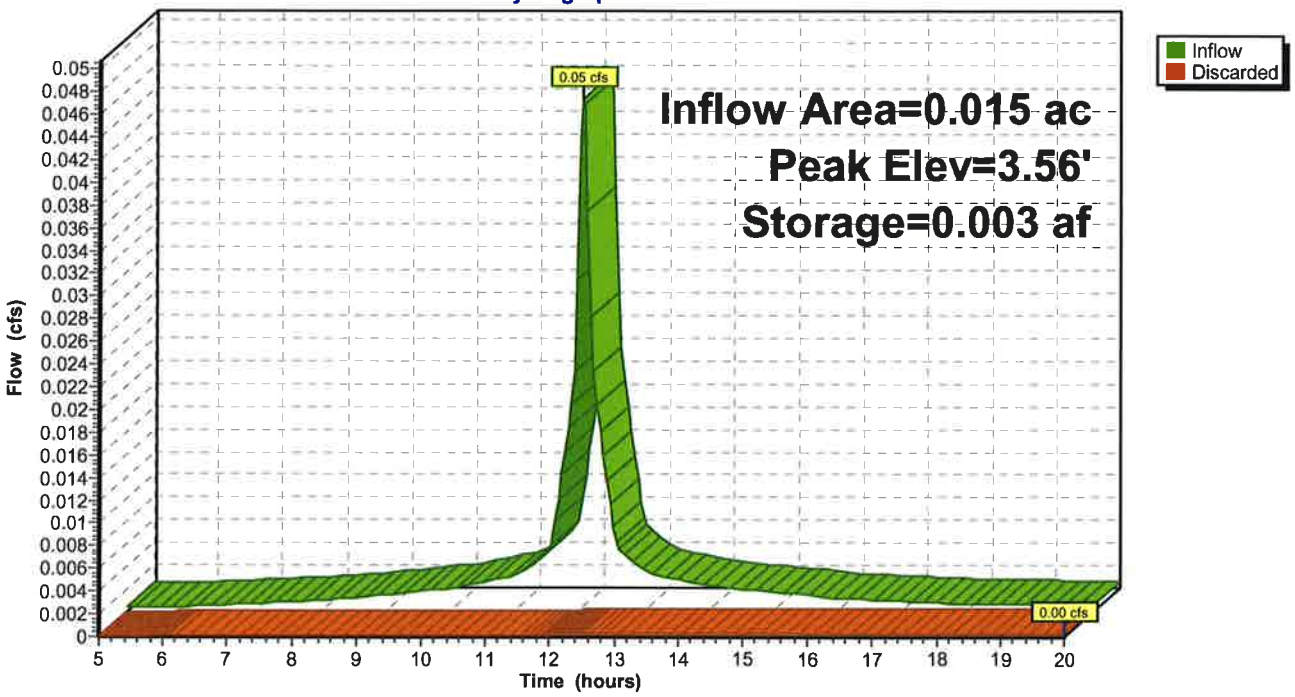
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.004 af	**6.00'D x 6.00'H Drywells** Inside #2 0.005 af Overall - 6.0" Wall Thickness = 0.004 af
#2	-1.00'	0.002 af	**8.00'D x 9.00'H Vertical Cone/Cylinder** 0.010 af Overall - 0.005 af Embedded = 0.005 af x 40.0% Voids
		0.006 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=3.56' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Pond D1: 6' Drywell

Hydrograph



Summary for Pond D2: 4' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 84.46'
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.011 ac,100.00% Impervious, Inflow Depth > 2.68" for 2 yr event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 13.60 hrs, Volume= 0.001 af, Atten= 92%, Lag= 90.8 min
Discarded = 0.00 cfs @ 13.60 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 89.46' @ 13.60 hrs Surf.Area= 0.001 ac Storage= 0.002 af

Plug-Flow detention time= 366.6 min calculated for 0.001 af (22% of inflow)
Center-of-Mass det. time= 187.3 min (926.2 - 738.9)

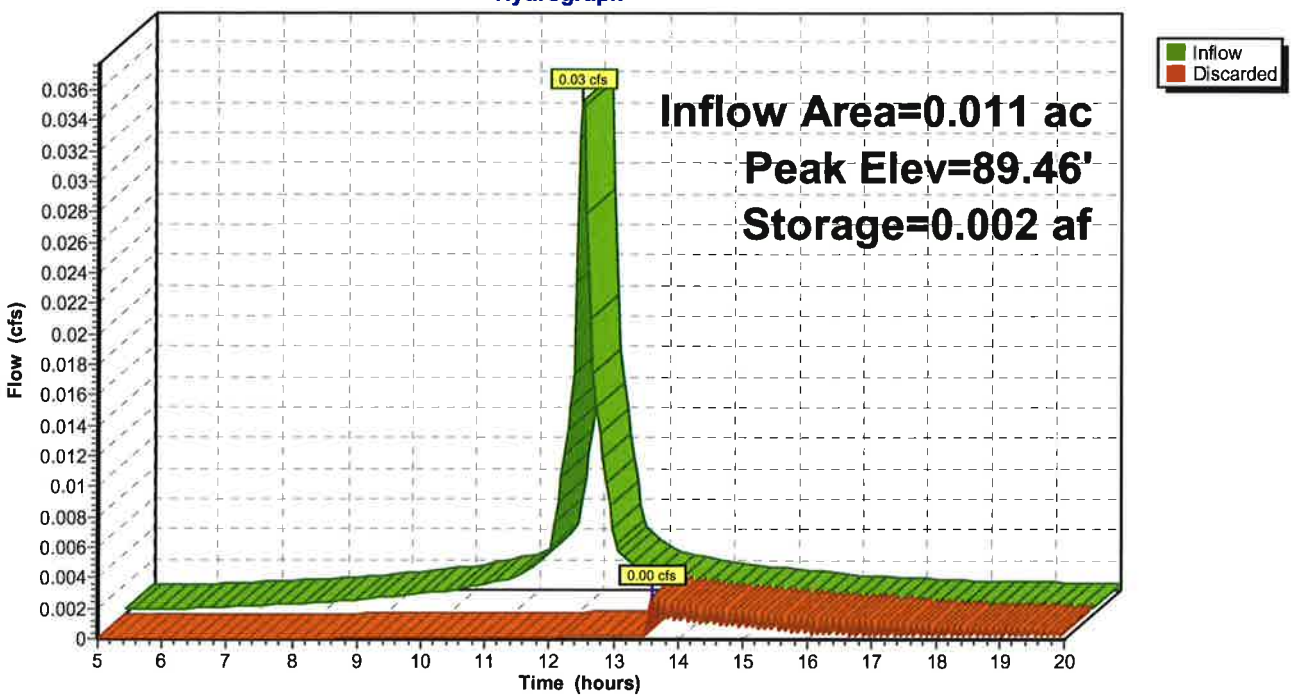
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.001 af	**4.00'D x 4.00'H Drywells** Inside #2 0.002 af Overall - 6.0" Wall Thickness = 0.001 af
#2	-1.00'	0.001 af	**6.00'D x 6.00'H Vertical Cone/Cylinder** 0.004 af Overall - 0.002 af Embedded = 0.002 af x 40.0% Voids
		0.002 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.00 cfs @ 13.60 hrs HW=89.46' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Pond D2: 4' Drywell

Hydrograph



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Post Development Runoff Area=8,814 sf 60.71% Impervious Runoff Depth>3.31"
Tc=6.0 min CN=91 Runoff=0.78 cfs 0.056 af

Subcatchment P2: New Roof Runoff Area=621 sf 100.00% Impervious Runoff Depth>3.96"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment P3: Stair Drain Runoff Area=50 sf 100.00% Impervious Runoff Depth>3.96"
Tc=6.0 min CN=98 Runoff=0.00 cfs 0.000 af

Subcatchment P4: Front Roof and Stair Runoff Area=500 sf 100.00% Impervious Runoff Depth>3.96"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.004 af

Subcatchment PRE: Predevelopment Runoff Area=9,984 sf 59.77% Impervious Runoff Depth>3.31"
Tc=6.0 min CN=91 Runoff=0.89 cfs 0.063 af

Reach POST: Total Post Development Inflow=0.78 cfs 0.056 af
Outflow=0.78 cfs 0.056 af

Pond D1: 6' Drywell Peak Elev=5.63' Storage=0.005 af Inflow=0.07 cfs 0.005 af
Outflow=0.00 cfs 0.000 af

Pond D2: 4' Drywell Peak Elev=2,027.22' Storage=0.002 af Inflow=0.05 cfs 0.004 af
Outflow=0.06 cfs 0.002 af

Total Runoff Area = 0.458 ac Runoff Volume = 0.128 af Average Runoff Depth = 3.34"
37.46% Pervious = 0.172 ac 62.54% Impervious = 0.287 ac

Summary for Subcatchment P1: Post Development Undetained

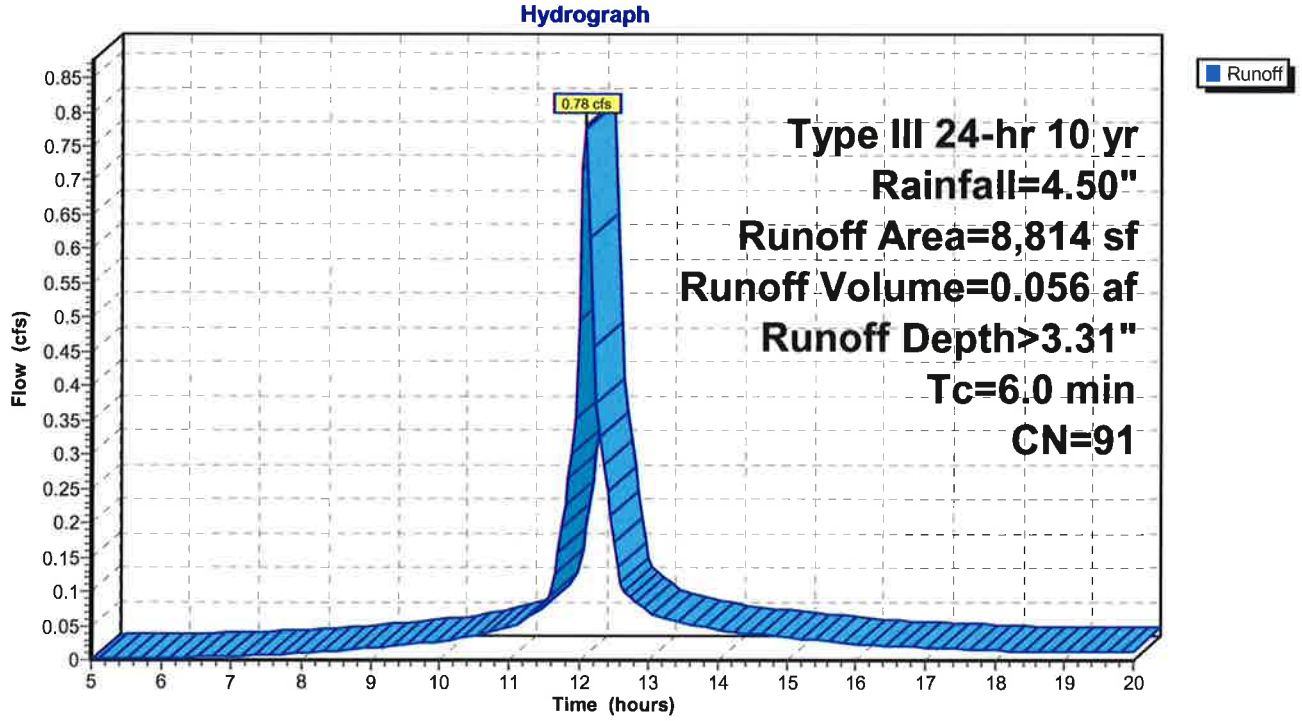
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 0.056 af, Depth> 3.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
	3,463	80	>75% Grass cover, Good, HSG D
*	5,351	98	Impervious
	8,814	91	Weighted Average
	3,463		39.29% Pervious Area
	5,351		60.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P1: Post Development Undetained



Summary for Subcatchment P2: New Roof

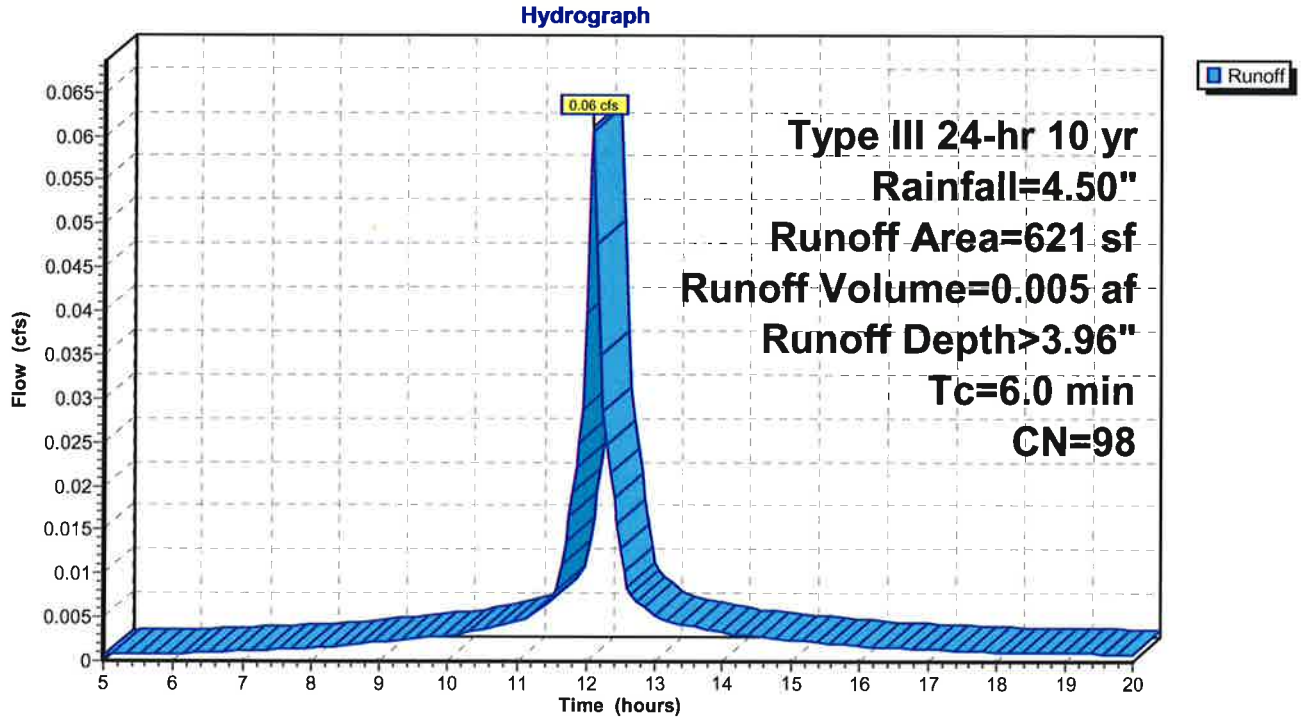
Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	621	98	Impervious
	621		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P2: New Roof



Summary for Subcatchment P3: Stair Drain

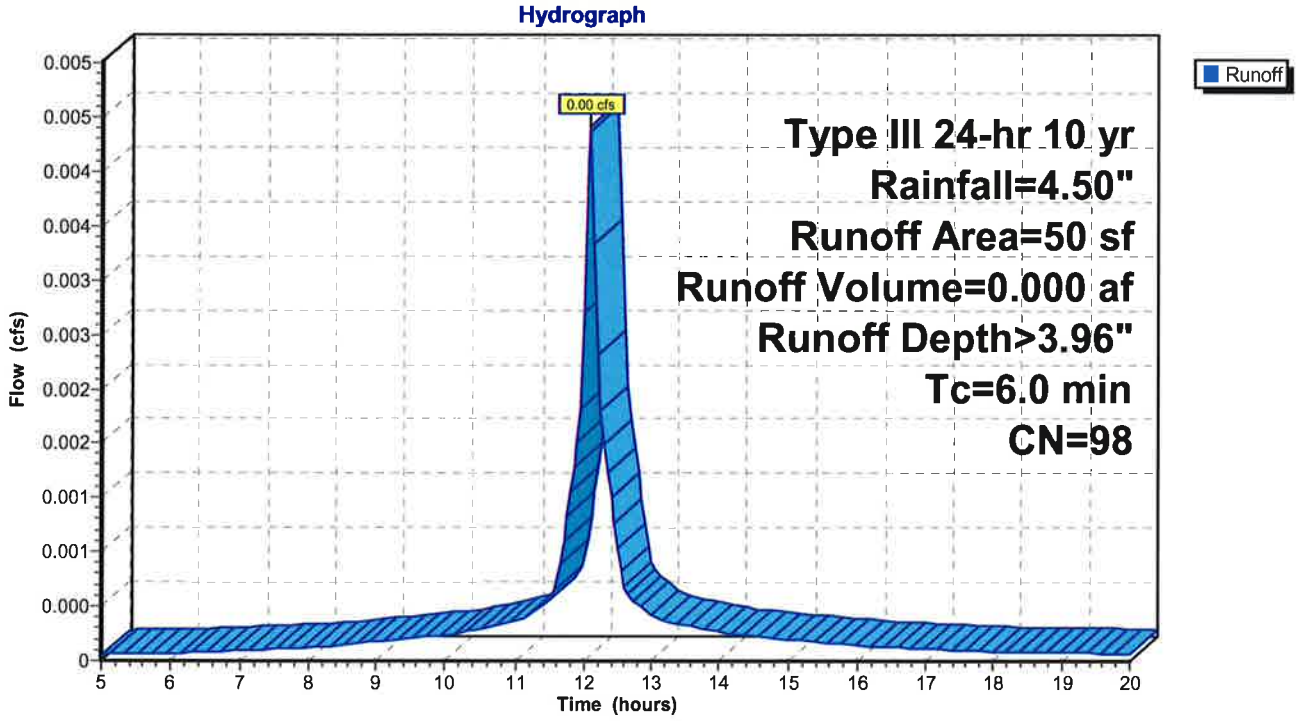
Runoff = 0.00 cfs @ 12.09 hrs, Volume= 0.000 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	50	98	Impervious
	50		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P3: Stair Drain



Summary for Subcatchment P4: Front Roof and Stair Drain

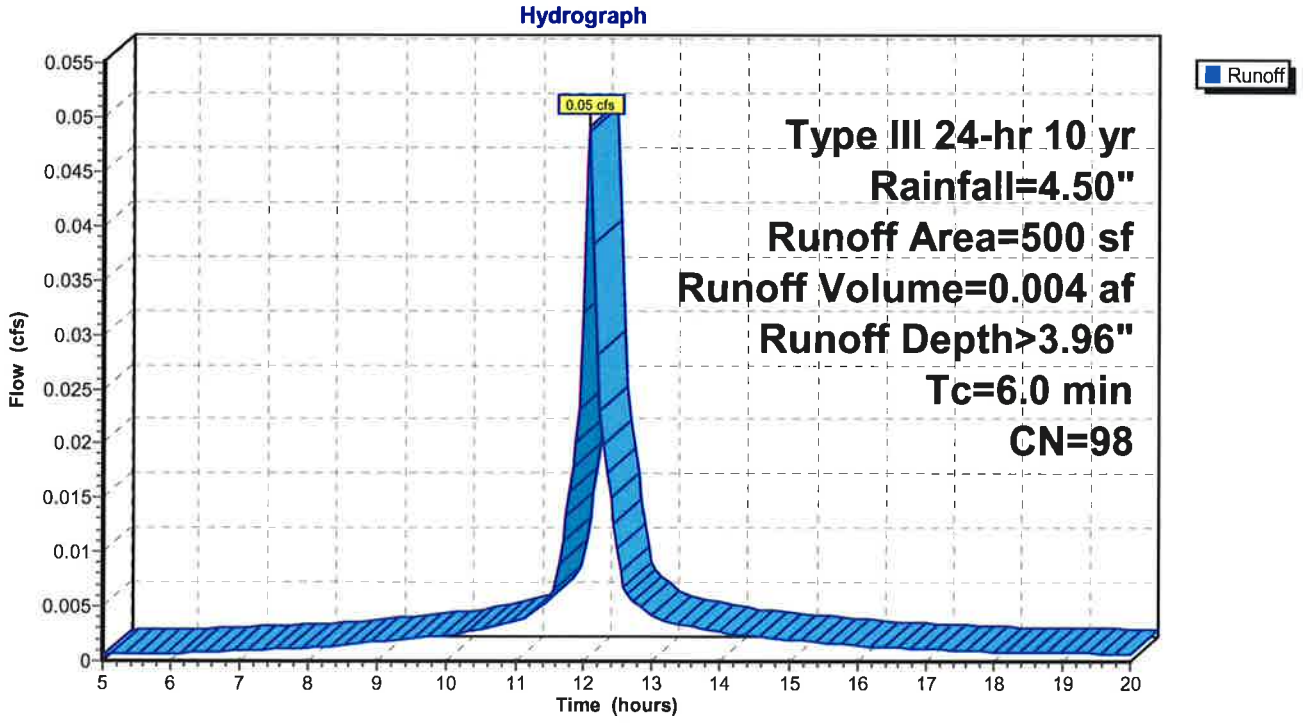
Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	500	98	Impervious
	500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P4: Front Roof and Stair Drain



Summary for Subcatchment PRE: Predevelopment

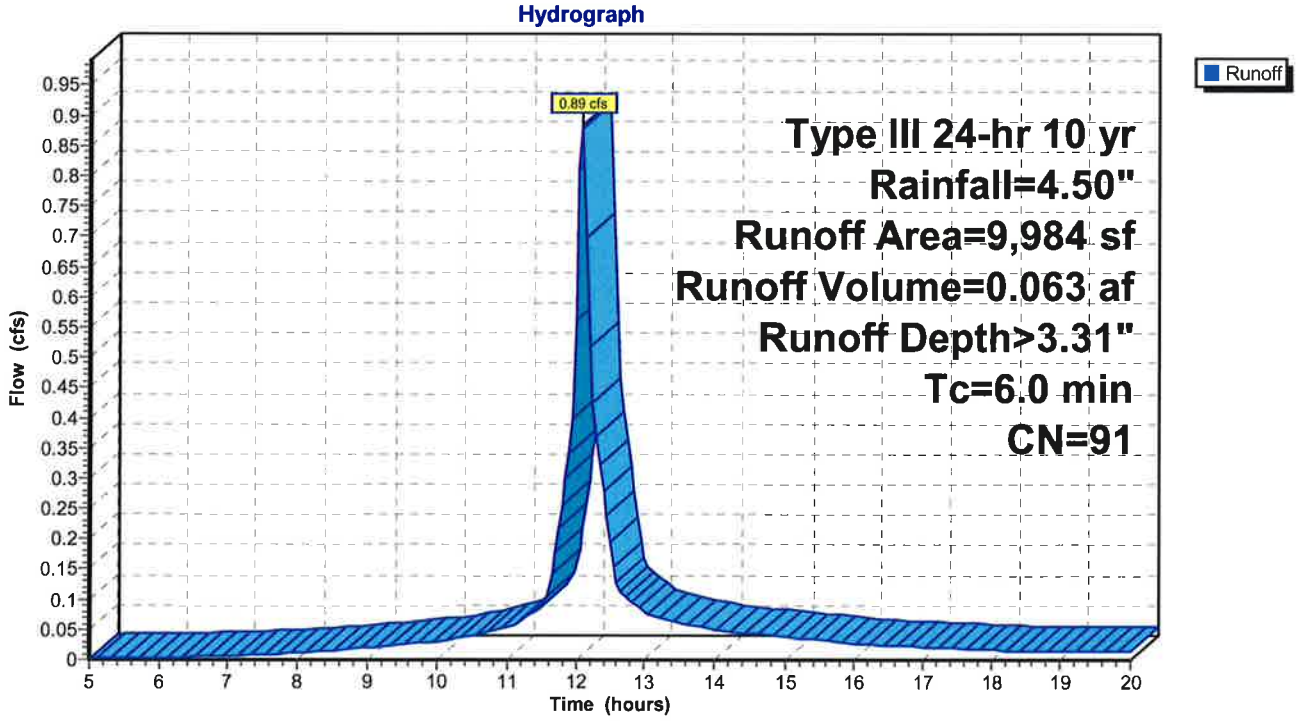
Runoff = 0.89 cfs @ 12.09 hrs, Volume= 0.063 af, Depth> 3.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	5,967	98	Impervious Area
	4,017	80	>75% Grass cover, Good, HSG D
	9,984	91	Weighted Average
	4,017		40.23% Pervious Area
	5,967		59.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment PRE: Predevelopment



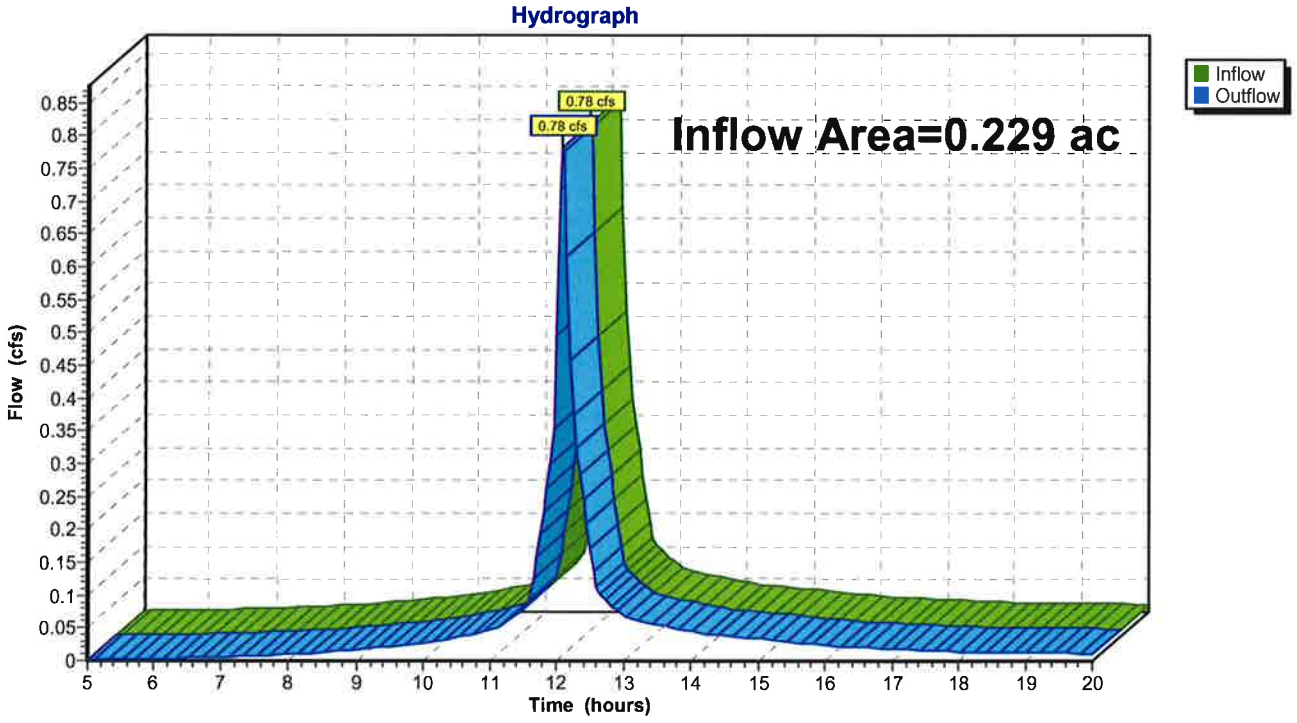
Summary for Reach POST: Total Post Development

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.229 ac, 65.32% Impervious, Inflow Depth > 2.92" for 10 yr event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 0.056 af
Outflow = 0.78 cfs @ 12.09 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach POST: Total Post Development



Summary for Pond D1: 6' Drywell

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth > 3.96" for 10 yr event
Inflow = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 99%, Lag= 474.8 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 5.63' @ 20.00 hrs Surf.Area= 0.001 ac Storage= 0.005 af

Plug-Flow detention time= 451.0 min calculated for 0.000 af (7% of inflow)
Center-of-Mass det. time= 136.7 min (872.4 - 735.8)

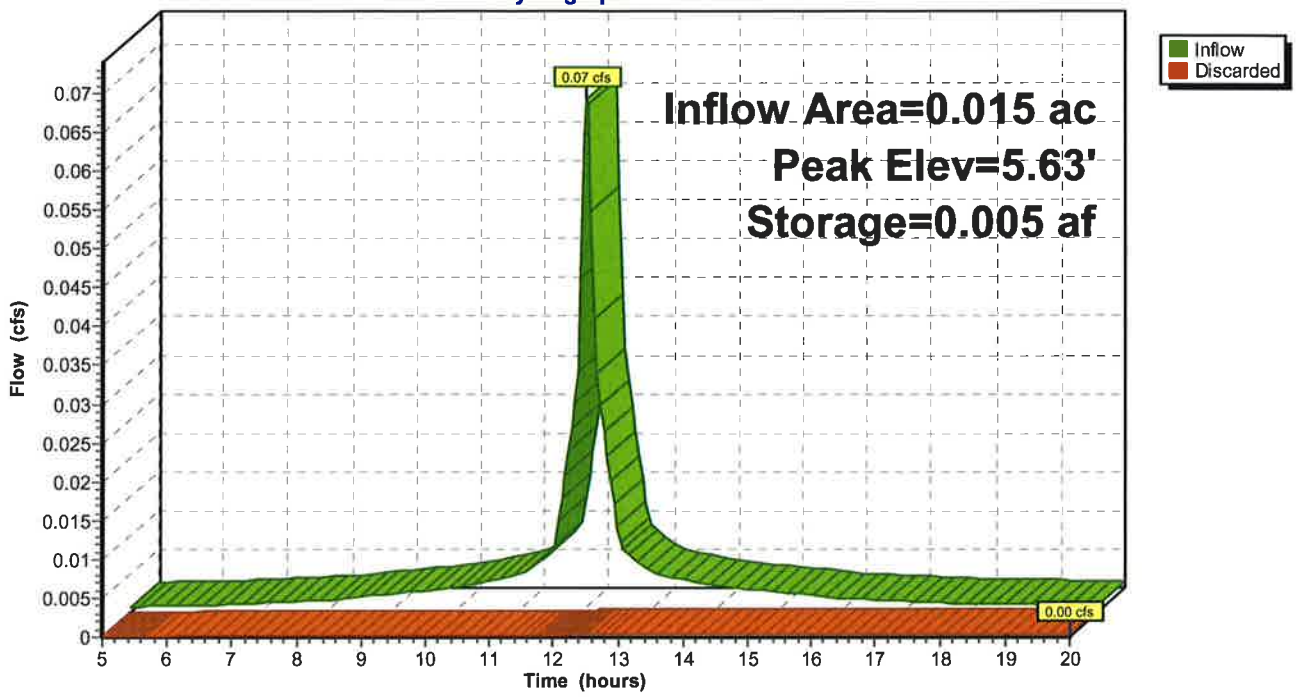
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.004 af	**6.00'D x 6.00'H Drywells** Inside #2 0.005 af Overall - 6.0" Wall Thickness = 0.004 af
#2	-1.00'	0.002 af	**8.00'D x 9.00'H Vertical Cone/Cylinder** 0.010 af Overall - 0.005 af Embedded = 0.005 af x 40.0% Voids
		0.006 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=5.63' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Pond D1: 6' Drywell

Hydrograph



Summary for Pond D2: 4' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 2,022.22'
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.011 ac,100.00% Impervious, Inflow Depth > 3.96" for 10 yr event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af
Outflow = 0.06 cfs @ 12.20 hrs, Volume= 0.002 af, Atten= 0%, Lag= 6.7 min
Discarded = 0.06 cfs @ 12.20 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,027.22' @ 12.20 hrs Surf.Area= 0.001 ac Storage= 0.002 af

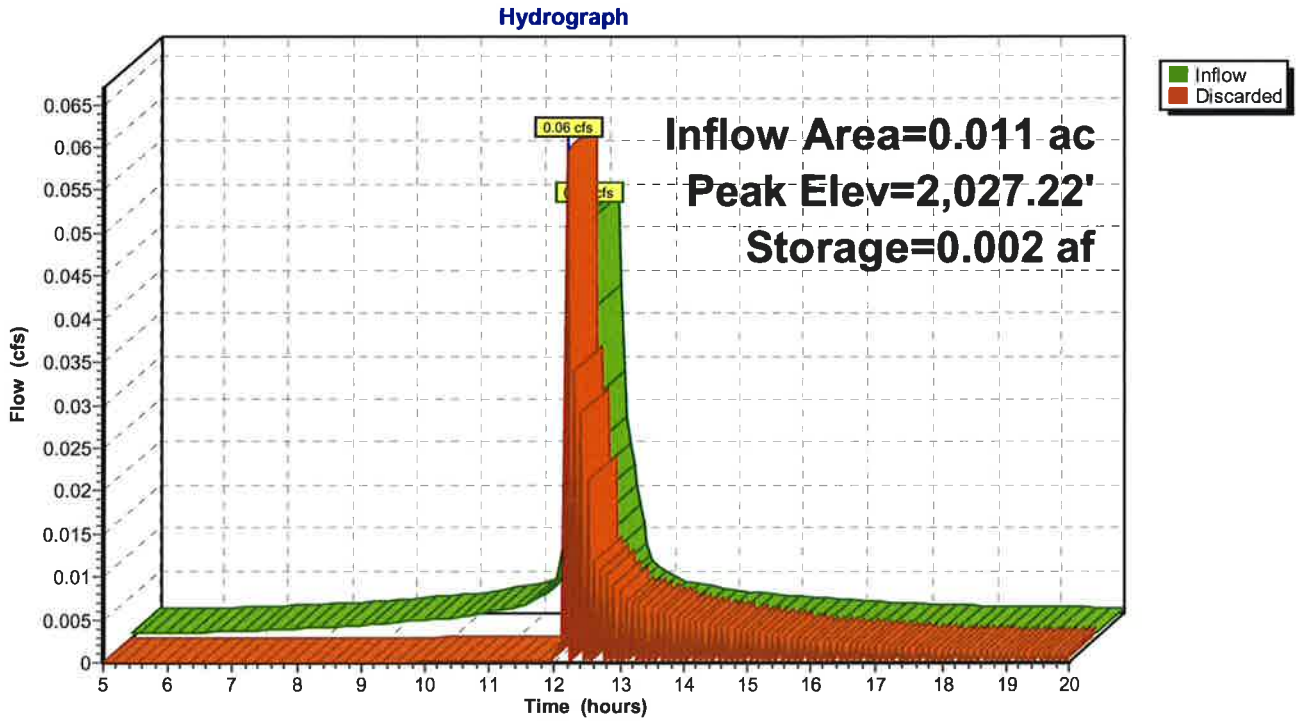
Plug-Flow detention time= 198.2 min calculated for 0.002 af (47% of inflow)
Center-of-Mass det. time= 97.8 min (833.5 - 735.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.001 af	**4.00'D x 4.00'H Drywells** Inside #2 0.002 af Overall - 6.0" Wall Thickness = 0.001 af
#2	-1.00'	0.001 af	**6.00'D x 6.00'H Vertical Cone/Cylinder** 0.004 af Overall - 0.002 af Embedded = 0.002 af x 40.0% Voids
		0.002 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.06 cfs @ 12.20 hrs HW=1,972.45' (Free Discharge)
1=Exfiltration (Controls 0.06 cfs)

Pond D2: 4' Drywell



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Post Development Runoff Area=8,814 sf 60.71% Impervious Runoff Depth>4.04"
Tc=6.0 min CN=91 Runoff=0.94 cfs 0.068 af

Subcatchment P2: New Roof Runoff Area=621 sf 100.00% Impervious Runoff Depth>4.69"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.006 af

Subcatchment P3: Stair Drain Runoff Area=50 sf 100.00% Impervious Runoff Depth>4.69"
Tc=6.0 min CN=98 Runoff=0.01 cfs 0.000 af

Subcatchment P4: Front Roof and Stair Runoff Area=500 sf 100.00% Impervious Runoff Depth>4.69"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.004 af

Subcatchment PRE: Predevelopment Runoff Area=9,984 sf 59.77% Impervious Runoff Depth>4.04"
Tc=6.0 min CN=91 Runoff=1.07 cfs 0.077 af

Reach POST: Total Post Development Inflow=0.94 cfs 0.068 af
Outflow=0.94 cfs 0.068 af

Pond D1: 6' Drywell Peak Elev=7.31' Storage=0.006 af Inflow=0.08 cfs 0.006 af
Outflow=0.00 cfs 0.000 af

Pond D2: 4' Drywell Peak Elev=3,020.42' Storage=0.002 af Inflow=0.06 cfs 0.004 af
Outflow=0.09 cfs 0.002 af

Total Runoff Area = 0.458 ac Runoff Volume = 0.156 af Average Runoff Depth = 4.08"
37.46% Pervious = 0.172 ac 62.54% Impervious = 0.287 ac

Summary for Subcatchment P1: Post Development Undetained

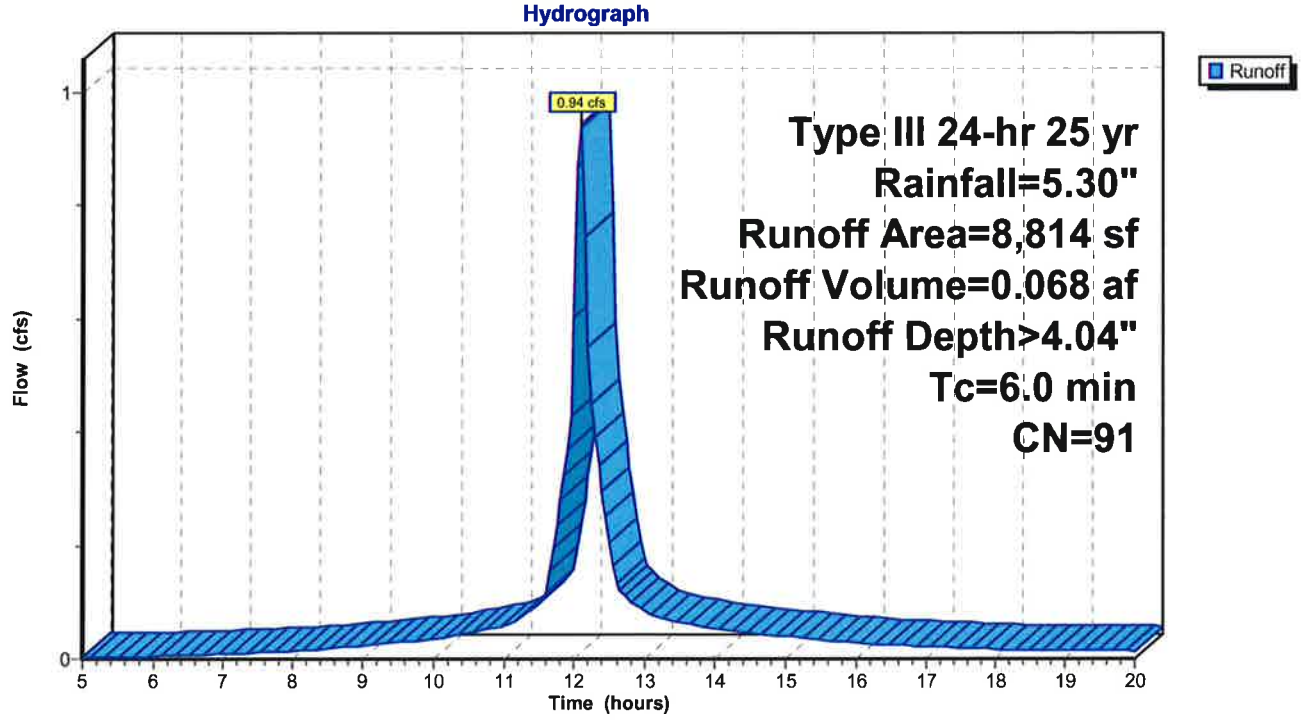
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.068 af, Depth> 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.30"

	Area (sf)	CN	Description
	3,463	80	>75% Grass cover, Good, HSG D
*	5,351	98	Impervious
	8,814	91	Weighted Average
	3,463		39.29% Pervious Area
	5,351		60.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P1: Post Development Undetained



Summary for Subcatchment P2: New Roof

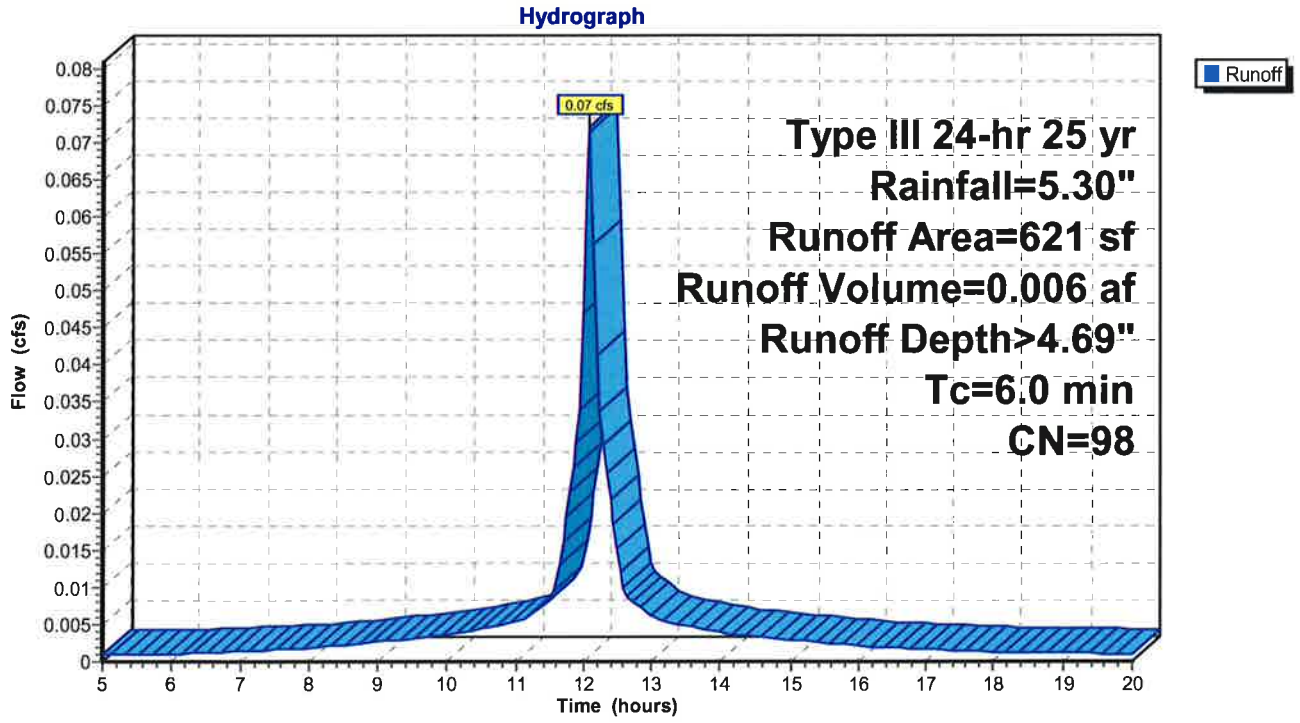
Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.30"

	Area (sf)	CN	Description
*	621	98	Impervious
	621		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P2: New Roof



Summary for Subcatchment P3: Stair Drain

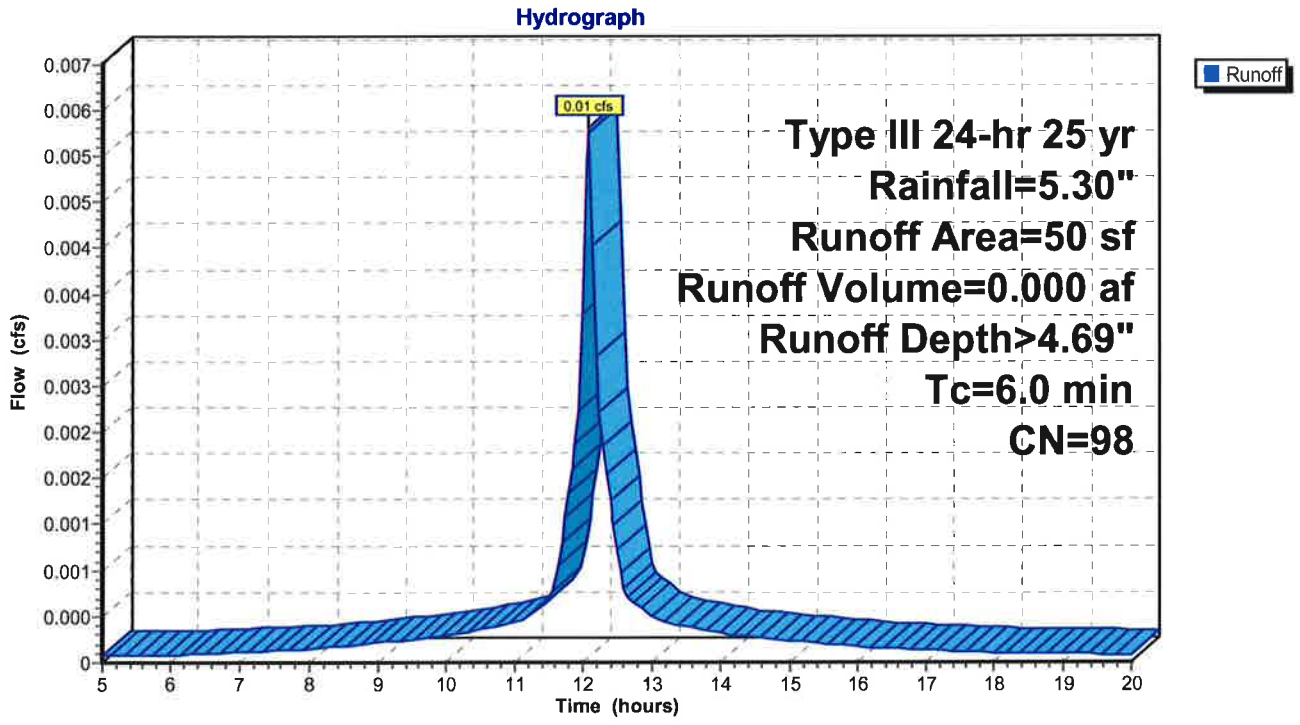
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 0.000 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.30"

	Area (sf)	CN	Description
*	50	98	Impervious
	50		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P3: Stair Drain



Summary for Subcatchment P4: Front Roof and Stair Drain

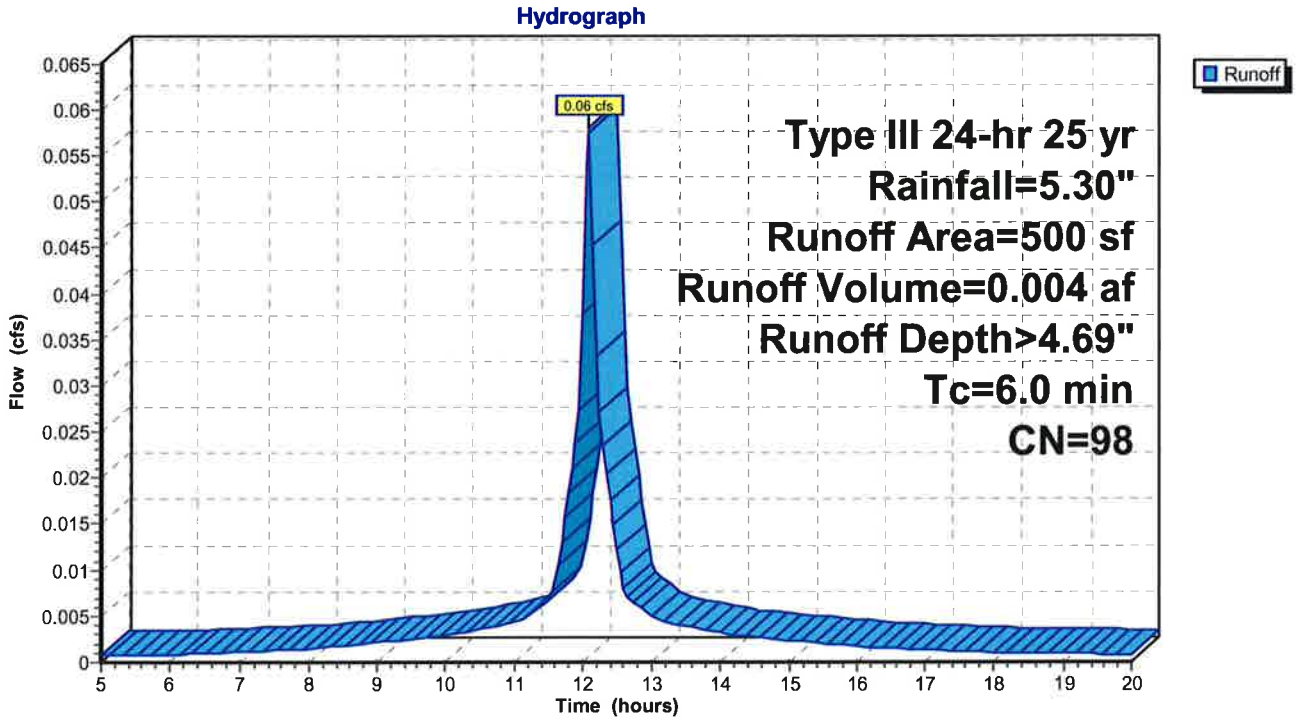
Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.004 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.30"

	Area (sf)	CN	Description
*	500	98	Impervious
	500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P4: Front Roof and Stair Drain



Summary for Subcatchment PRE: Predevelopment

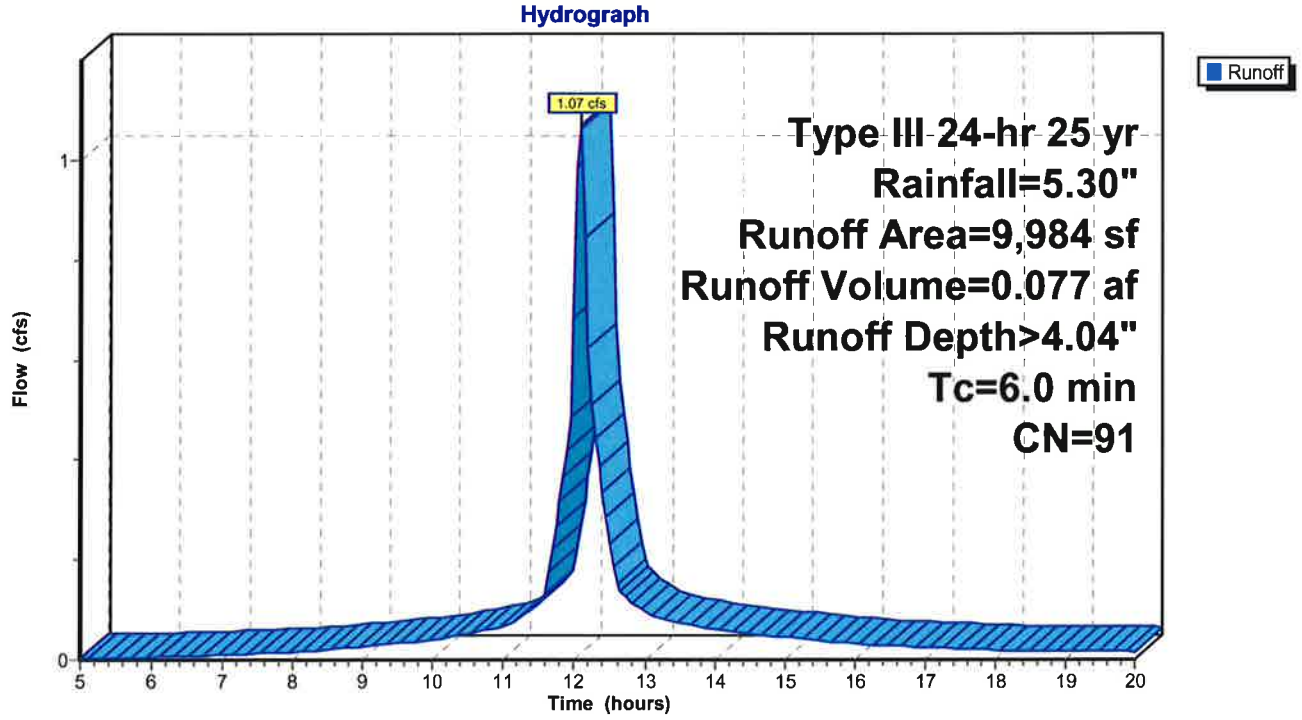
Runoff = 1.07 cfs @ 12.09 hrs, Volume= 0.077 af, Depth> 4.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.30"

	Area (sf)	CN	Description
*	5,967	98	Impervious Area
	4,017	80	>75% Grass cover, Good, HSG D
	9,984	91	Weighted Average
	4,017		40.23% Pervious Area
	5,967		59.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment PRE: Predevelopment



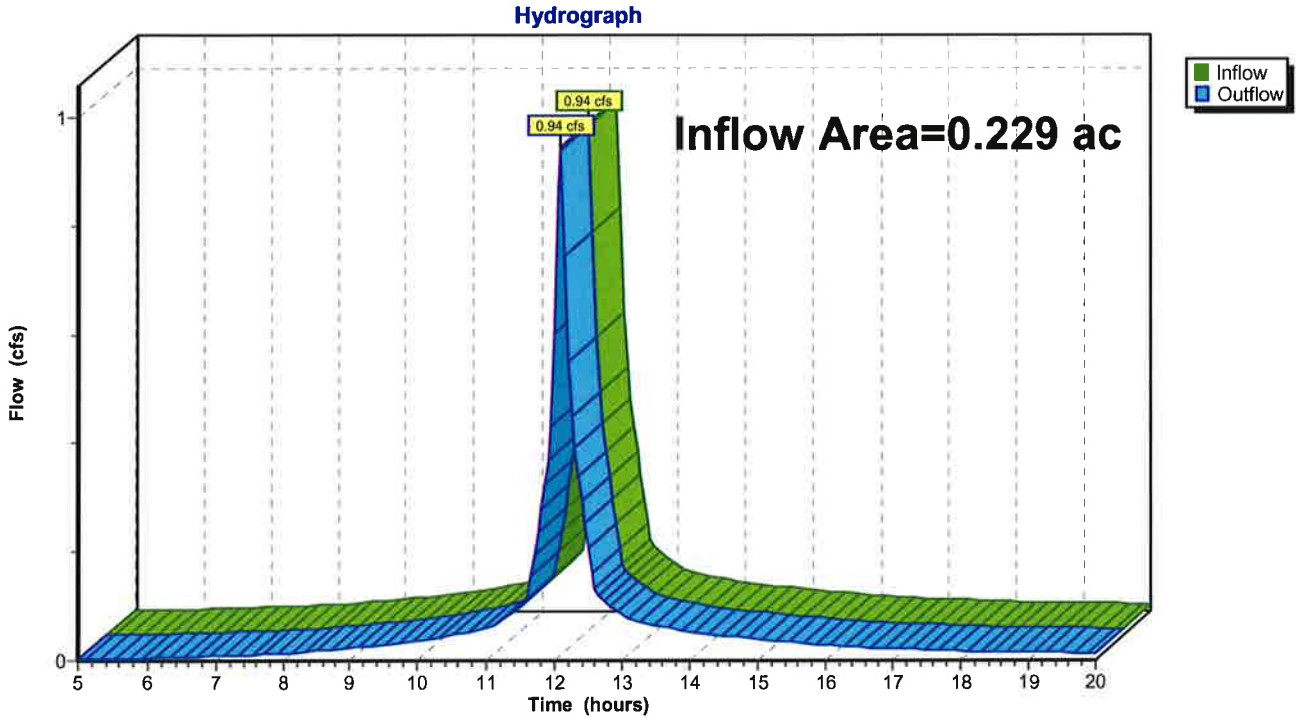
Summary for Reach POST: Total Post Development

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.229 ac, 65.32% Impervious, Inflow Depth > 3.57" for 25 yr event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 0.068 af
Outflow = 0.94 cfs @ 12.09 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach POST: Total Post Development



Summary for Pond D1: 6' Drywell

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth > 4.69" for 25 yr event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 99%, Lag= 474.8 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.31' @ 20.00 hrs Surf.Area= 0.001 ac Storage= 0.006 af

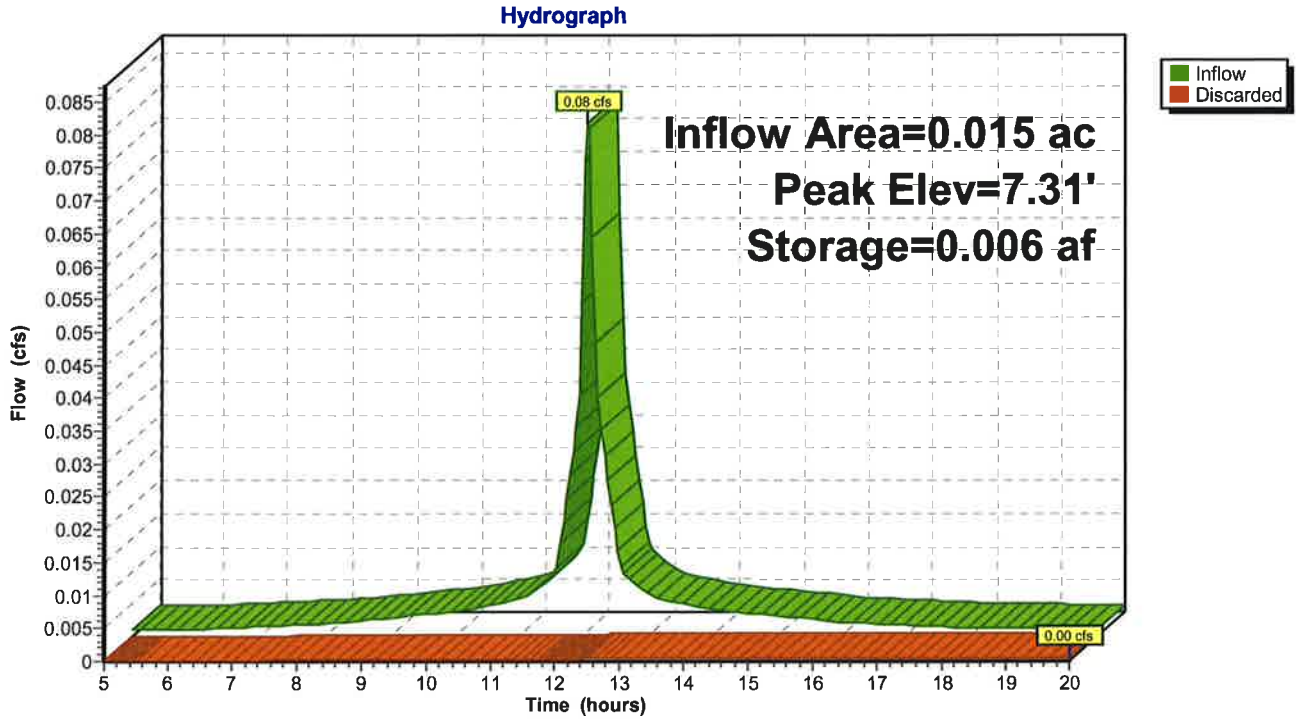
Plug-Flow detention time= 466.3 min calculated for 0.000 af (7% of inflow)
Center-of-Mass det. time= 146.8 min (881.6 - 734.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.004 af	**6.00'D x 6.00'H Drywells** Inside #2 0.005 af Overall - 6.0" Wall Thickness = 0.004 af
#2	-1.00'	0.002 af	**8.00'D x 9.00'H Vertical Cone/Cylinder** 0.010 af Overall - 0.005 af Embedded = 0.005 af x 40.0% Voids
		0.006 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=7.31' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Pond D1: 6' Drywell



Summary for Pond D2: 4' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 3,015.42'
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.011 ac,100.00% Impervious, Inflow Depth > 4.69" for 25 yr event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 0.004 af
Outflow = 0.09 cfs @ 12.10 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.9 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3,020.42' @ 12.10 hrs Surf.Area= 0.001 ac Storage= 0.002 af

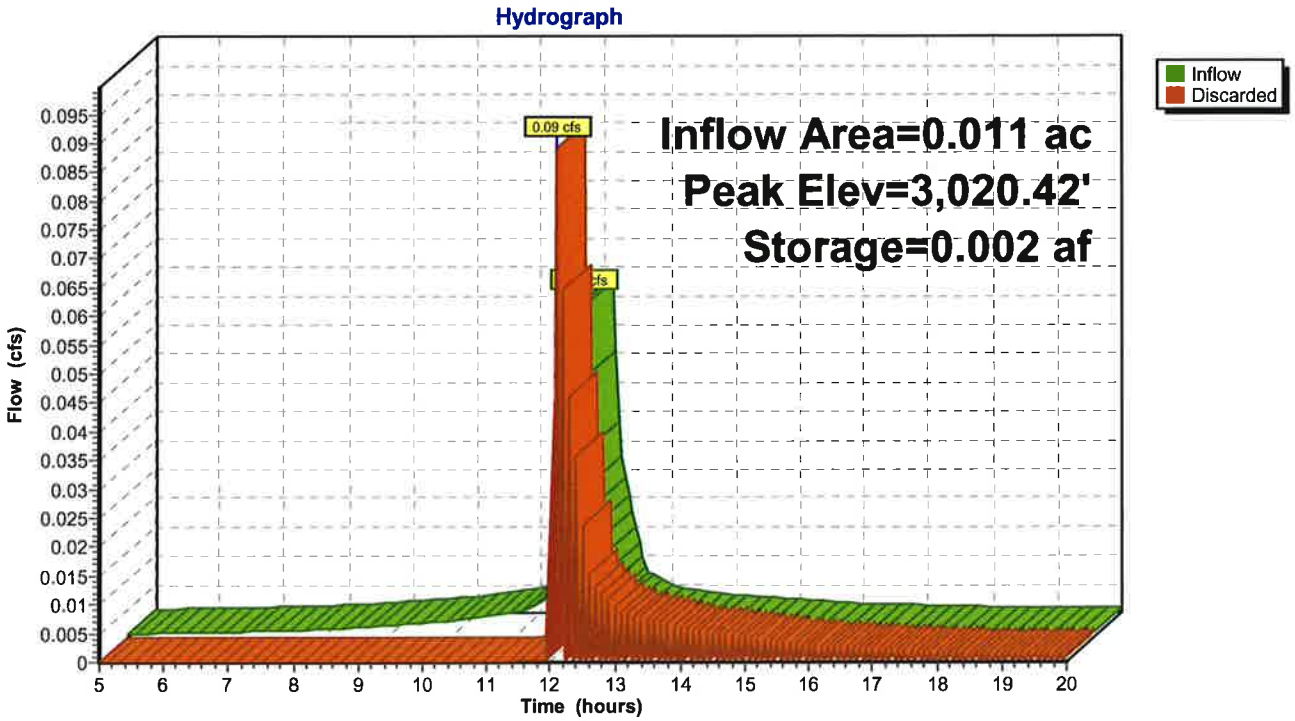
Plug-Flow detention time= 169.0 min calculated for 0.002 af (55% of inflow)
Center-of-Mass det. time= 82.7 min (817.5 - 734.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.001 af	**4.00'D x 4.00'H Drywells** Inside #2 0.002 af Overall - 6.0" Wall Thickness = 0.001 af
#2	-1.00'	0.001 af	**6.00'D x 6.00'H Vertical Cone/Cylinder** 0.004 af Overall - 0.002 af Embedded = 0.002 af x 40.0% Voids
		0.002 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=2,908.77' (Free Discharge)
1=Exfiltration (Controls 0.09 cfs)

Pond D2: 4' Drywell



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Post Development Runoff Area=8,814 sf 60.71% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=91 Runoff=1.07 cfs 0.077 af

Subcatchment P2: New Roof Runoff Area=621 sf 100.00% Impervious Runoff Depth>5.24"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment P3: Stair Drain Runoff Area=50 sf 100.00% Impervious Runoff Depth>5.24"
Tc=6.0 min CN=98 Runoff=0.01 cfs 0.001 af

Subcatchment P4: Front Roof and Stair Runoff Area=500 sf 100.00% Impervious Runoff Depth>5.24"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment PRE: Predevelopment Runoff Area=9,984 sf 59.77% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=91 Runoff=1.21 cfs 0.088 af

Reach POST: Total Post Development Inflow=1.07 cfs 0.077 af
Outflow=1.07 cfs 0.077 af

Pond D1: 6' Drywell Peak Elev=62.54' Storage=0.006 af Inflow=0.09 cfs 0.007 af
Outflow=0.00 cfs 0.001 af

Pond D2: 4' Drywell Peak Elev=3,133.49' Storage=0.002 af Inflow=0.06 cfs 0.005 af
Outflow=0.09 cfs 0.003 af

Total Runoff Area = 0.458 ac Runoff Volume = 0.177 af Average Runoff Depth = 4.63"
37.46% Pervious = 0.172 ac 62.54% Impervious = 0.287 ac

Summary for Subcatchment P1: Post Development Undetained

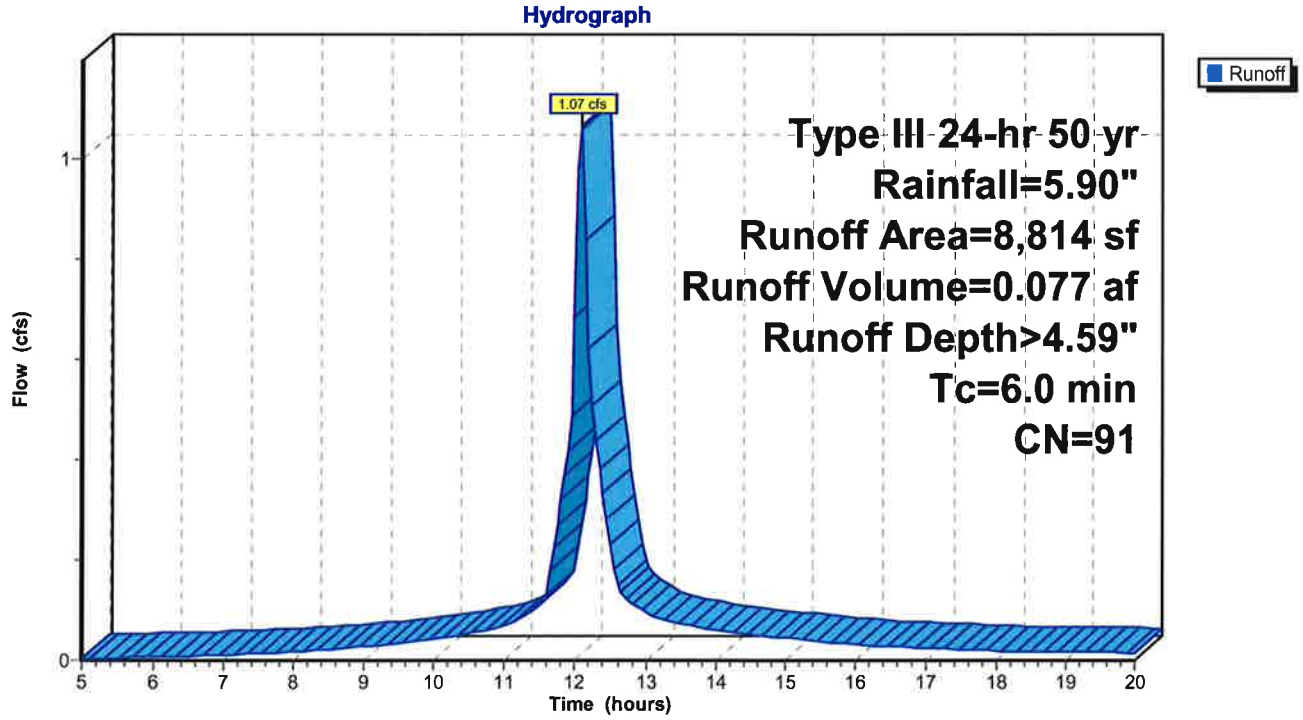
Runoff = 1.07 cfs @ 12.09 hrs, Volume= 0.077 af, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=5.90"

	Area (sf)	CN	Description
	3,463	80	>75% Grass cover, Good, HSG D
*	5,351	98	Impervious
	8,814	91	Weighted Average
	3,463		39.29% Pervious Area
	5,351		60.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P1: Post Development Undetained



Summary for Subcatchment P2: New Roof

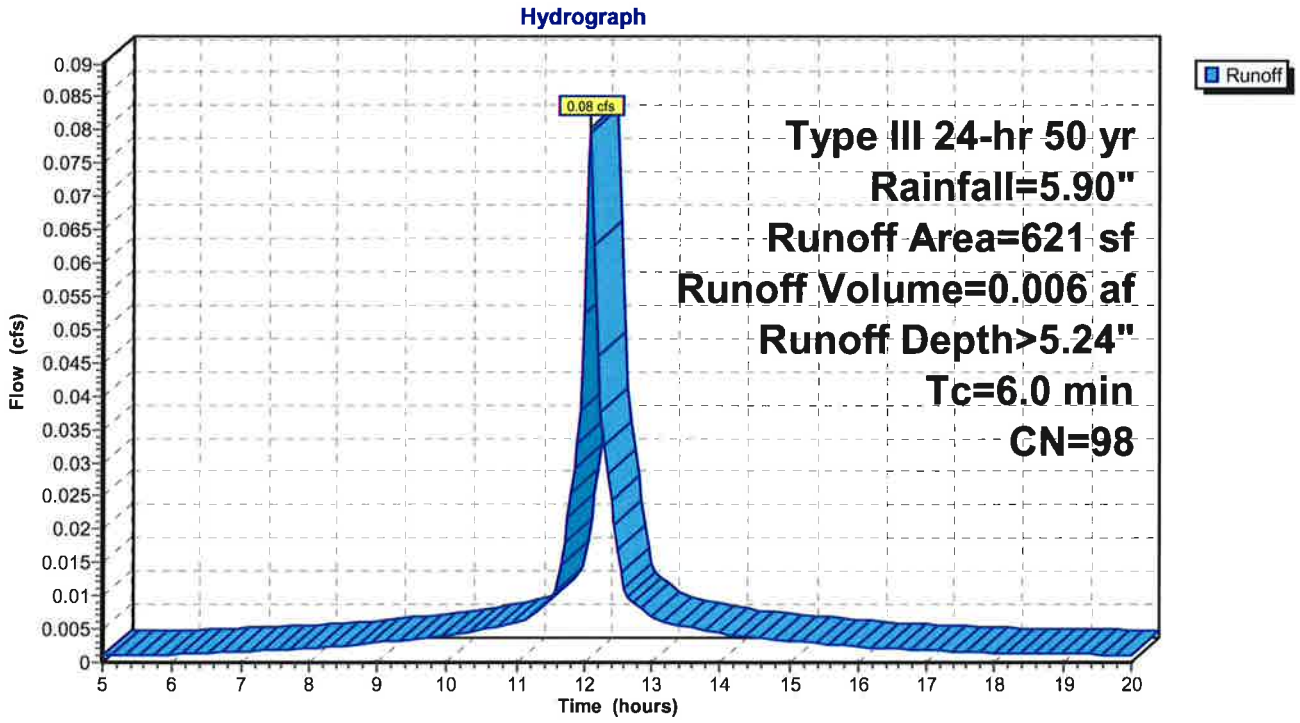
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=5.90"

	Area (sf)	CN	Description
*	621	98	Impervious
	621		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P2: New Roof



Summary for Subcatchment P3: Stair Drain

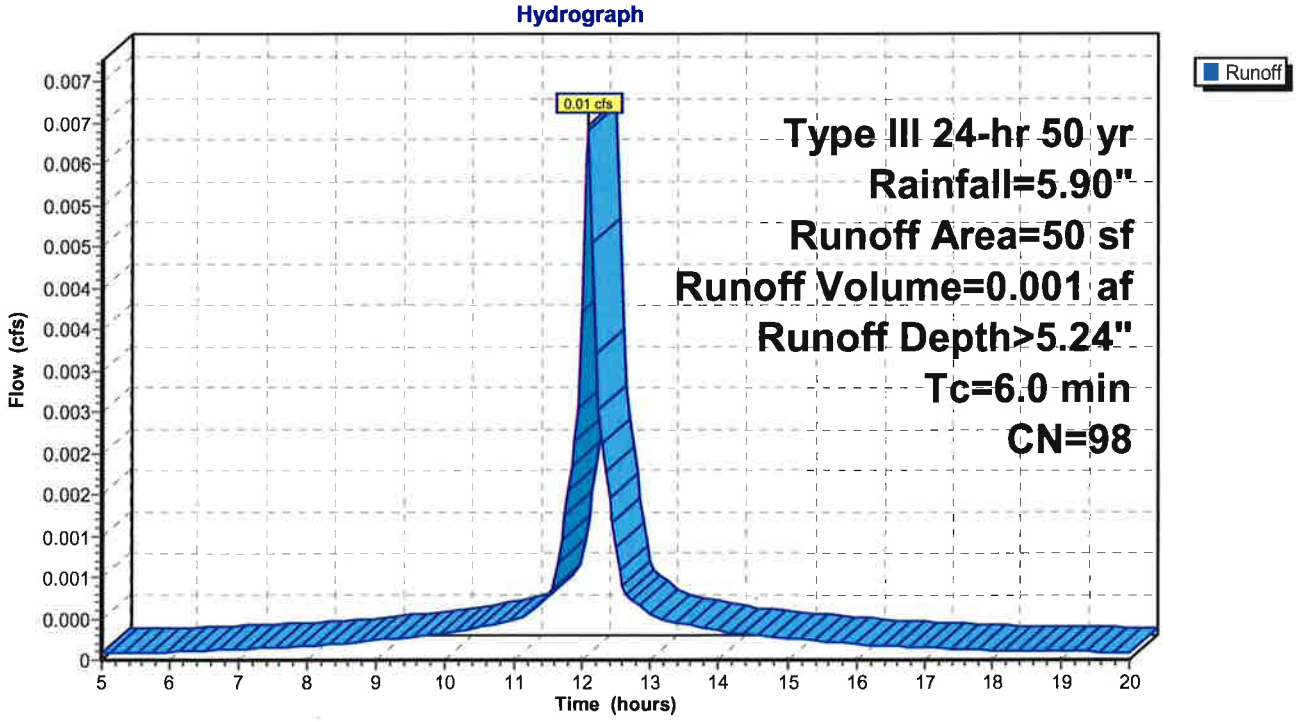
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 0.001 af, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=5.90"

	Area (sf)	CN	Description
*	50	98	Impervious
	50		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P3: Stair Drain



Summary for Subcatchment P4: Front Roof and Stair Drain

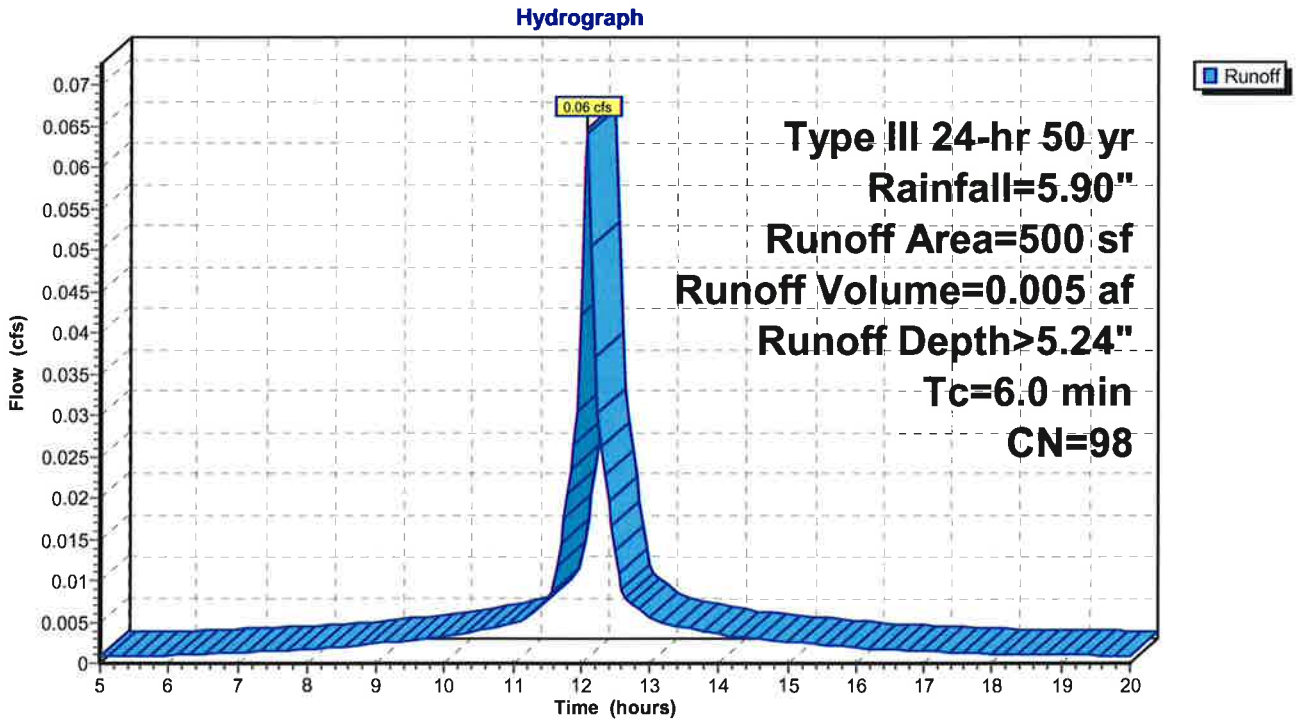
Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth> 5.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=5.90"

	Area (sf)	CN	Description
*	500	98	Impervious
	500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P4: Front Roof and Stair Drain



Summary for Subcatchment PRE: Predevelopment

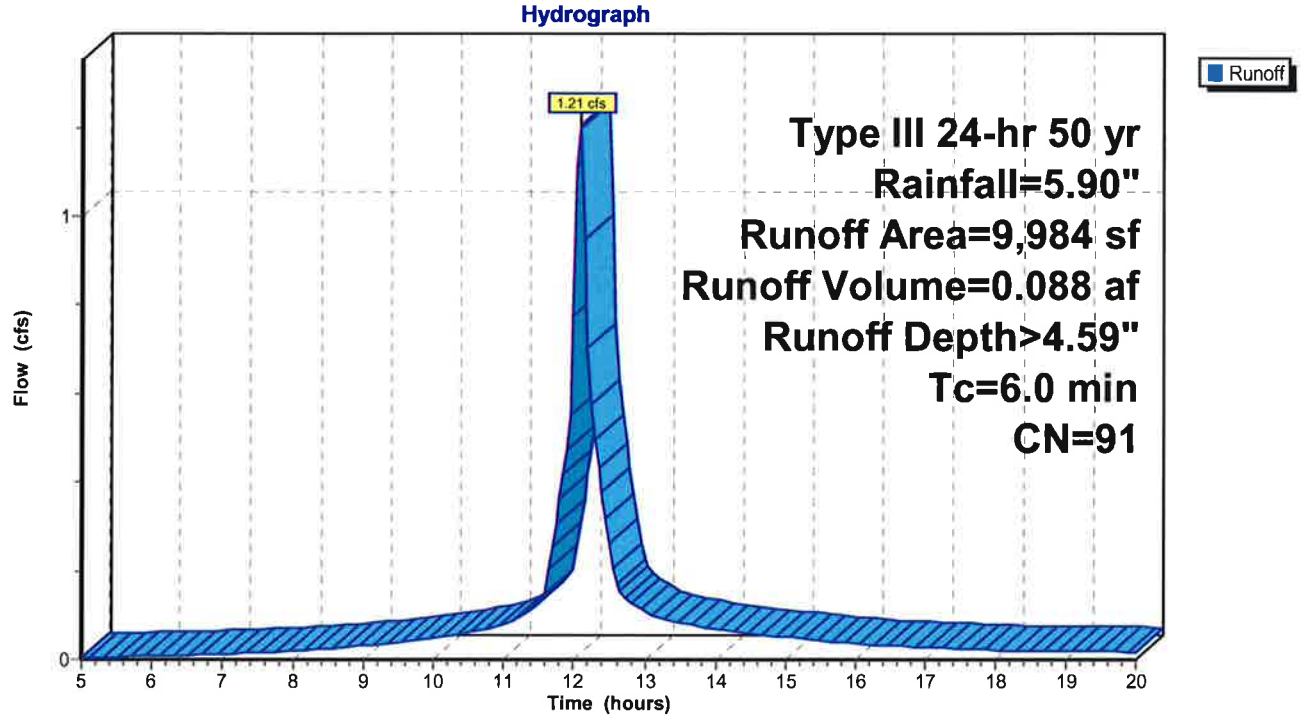
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.088 af, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=5.90"

	Area (sf)	CN	Description
*	5,967	98	Impervious Area
	4,017	80	>75% Grass cover, Good, HSG D
	9,984	91	Weighted Average
	4,017		40.23% Pervious Area
	5,967		59.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment PRE: Predevelopment



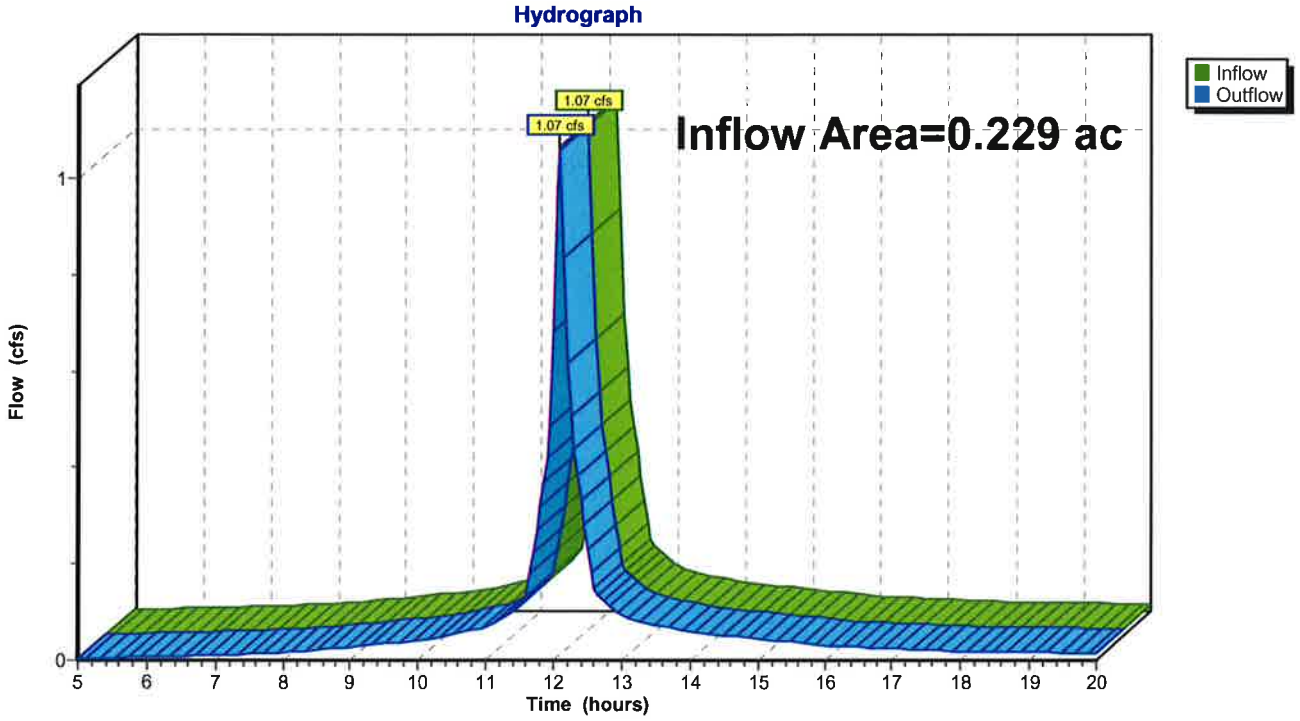
Summary for Reach POST: Total Post Development

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.229 ac, 65.32% Impervious, Inflow Depth > 4.05" for 50 yr event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 0.077 af
Outflow = 1.07 cfs @ 12.09 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach POST: Total Post Development



Summary for Pond D1: 6' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 54.54'
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth > 5.24" for 50 yr event
Inflow = 0.09 cfs @ 12.09 hrs, Volume= 0.007 af
Outflow = 0.00 cfs @ 16.05 hrs, Volume= 0.001 af, Atten= 96%, Lag= 237.8 min
Discarded = 0.00 cfs @ 16.05 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 62.54' @ 16.05 hrs Surf.Area= 0.001 ac Storage= 0.006 af

Plug-Flow detention time= 501.3 min calculated for 0.001 af (12% of inflow)
Center-of-Mass det. time= 235.0 min (969.2 - 734.2)

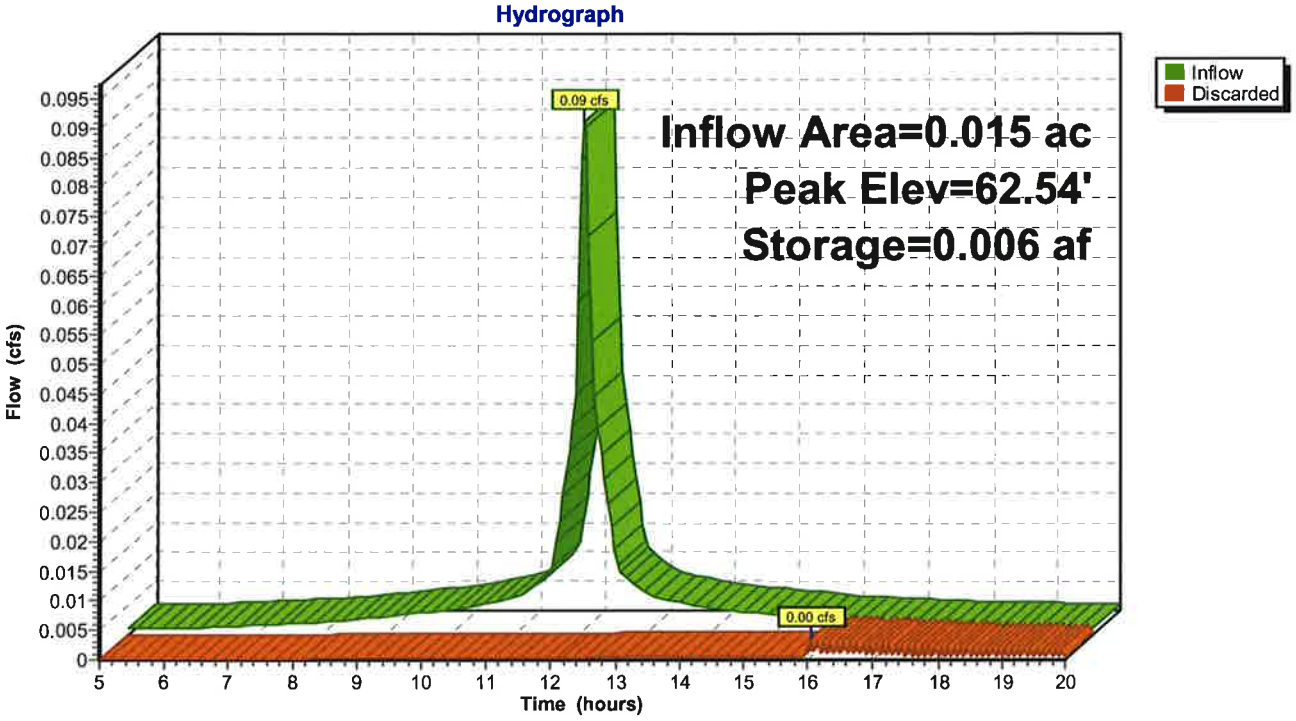
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.004 af	**6.00'D x 6.00'H Drywells** Inside #2 0.005 af Overall - 6.0" Wall Thickness = 0.004 af
#2	-1.00'	0.002 af	**8.00'D x 9.00'H Vertical Cone/Cylinder** 0.010 af Overall - 0.005 af Embedded = 0.005 af x 40.0% Voids
		0.006 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.00 cfs @ 16.05 hrs HW=62.54' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Pond D1: 6' Drywell

Hydrograph



Summary for Pond D2: 4' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 3,128.49'
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.011 ac,100.00% Impervious, Inflow Depth > 5.24" for 50 yr event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af
Outflow = 0.09 cfs @ 12.06 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.09 cfs @ 12.06 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3,133.49' @ 12.06 hrs Surf.Area= 0.001 ac Storage= 0.002 af

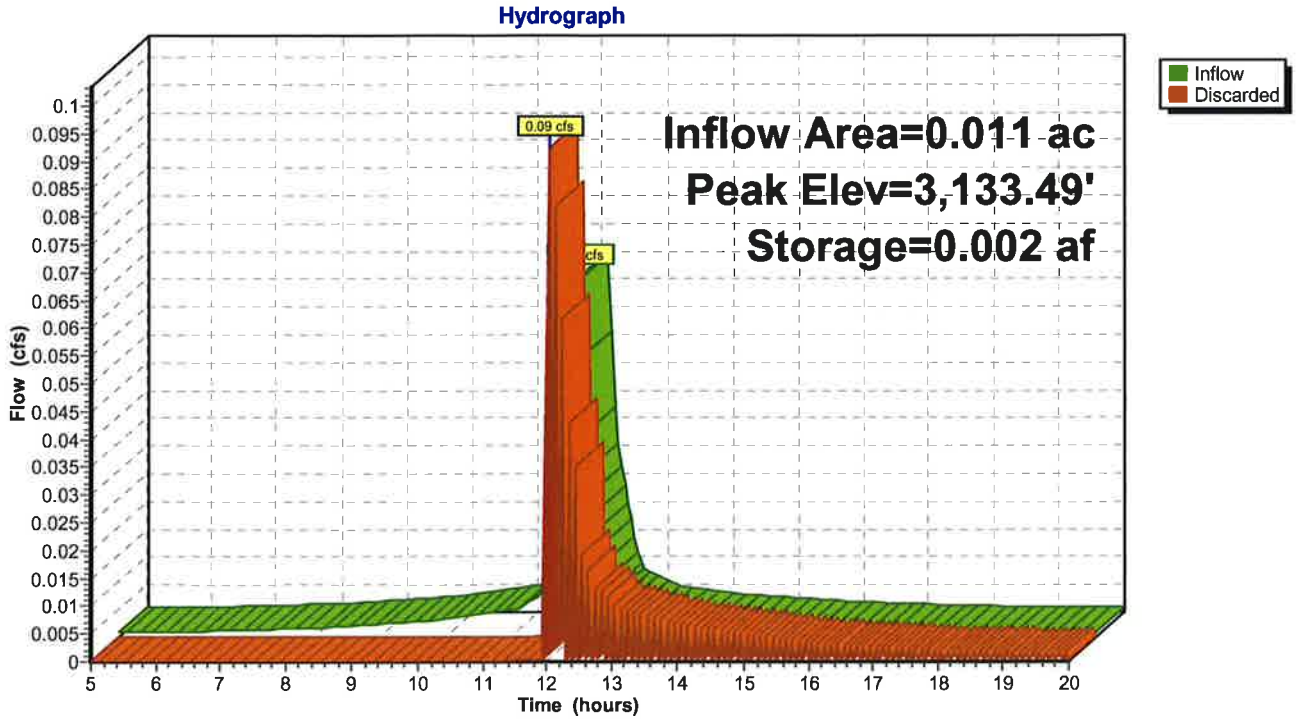
Plug-Flow detention time= 156.5 min calculated for 0.003 af (60% of inflow)
Center-of-Mass det. time= 75.4 min (809.7 - 734.2)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.001 af	**4.00'D x 4.00'H Drywells** Inside #2 0.002 af Overall - 6.0" Wall Thickness = 0.001 af
#2	-1.00'	0.001 af	**6.00'D x 6.00'H Vertical Cone/Cylinder** 0.004 af Overall - 0.002 af Embedded = 0.002 af x 40.0% Voids
		0.002 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.09 cfs @ 12.06 hrs HW=2,887.29' (Free Discharge)
1=Exfiltration (Controls 0.09 cfs)

Pond D2: 4' Drywell



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Post Development Runoff Area=8,814 sf 60.71% Impervious Runoff Depth>5.15"
Tc=6.0 min CN=91 Runoff=1.19 cfs 0.087 af

Subcatchment P2: New Roof Runoff Area=621 sf 100.00% Impervious Runoff Depth>5.78"
Tc=6.0 min CN=98 Runoff=0.09 cfs 0.007 af

Subcatchment P3: Stair Drain Runoff Area=50 sf 100.00% Impervious Runoff Depth>5.78"
Tc=6.0 min CN=98 Runoff=0.01 cfs 0.001 af

Subcatchment P4: Front Roof and Stair Runoff Area=500 sf 100.00% Impervious Runoff Depth>5.78"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.006 af

Subcatchment PRE: Predevelopment Runoff Area=9,984 sf 59.77% Impervious Runoff Depth>5.15"
Tc=6.0 min CN=91 Runoff=1.35 cfs 0.098 af

Reach POST: Total Post Development Inflow=1.19 cfs 0.087 af
Outflow=1.19 cfs 0.087 af

Pond D1: 6' Drywell Peak Elev=190.77' Storage=0.006 af Inflow=0.10 cfs 0.007 af
Outflow=0.01 cfs 0.001 af

Pond D2: 4' Drywell Peak Elev=3,101.61' Storage=0.002 af Inflow=0.07 cfs 0.006 af
Outflow=0.09 cfs 0.004 af

Total Runoff Area = 0.458 ac Runoff Volume = 0.198 af Average Runoff Depth = 5.18"
37.46% Pervious = 0.172 ac 62.54% Impervious = 0.287 ac

Summary for Subcatchment P1: Post Development Undetained

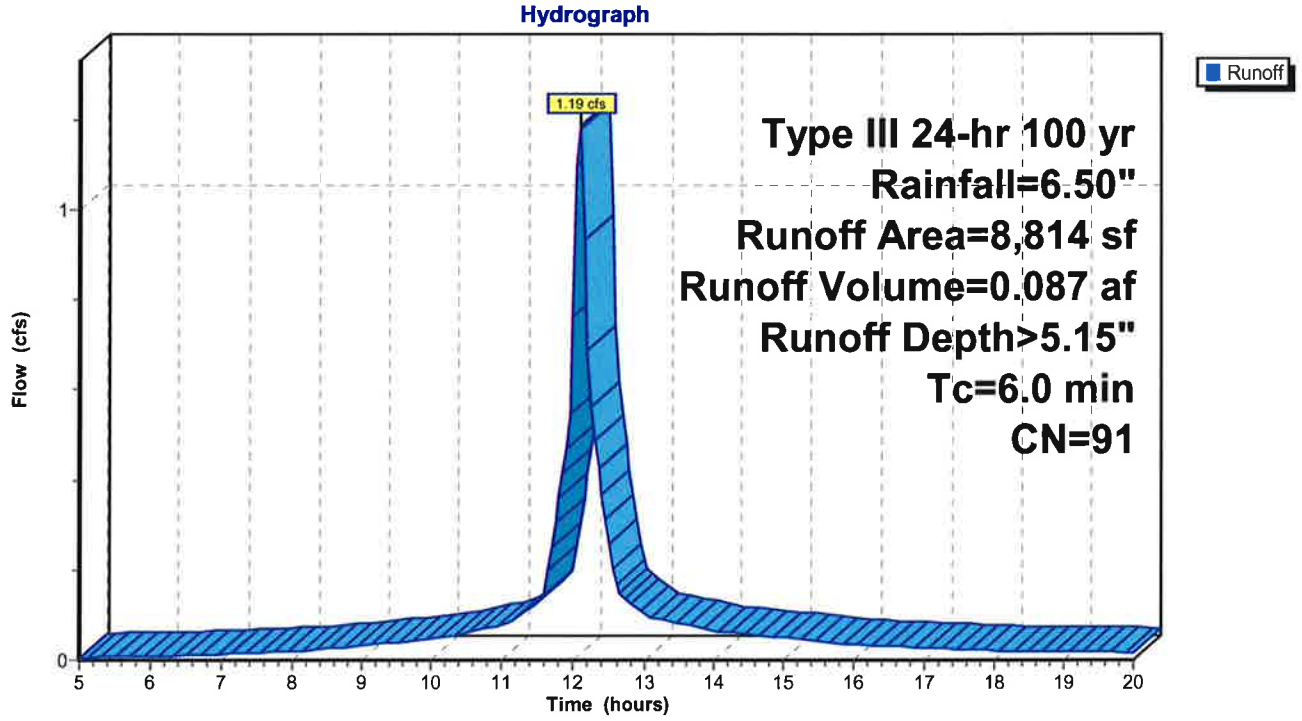
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.087 af, Depth> 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

	Area (sf)	CN	Description
	3,463	80	>75% Grass cover, Good, HSG D
*	5,351	98	Impervious
	8,814	91	Weighted Average
	3,463		39.29% Pervious Area
	5,351		60.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P1: Post Development Undetained



Summary for Subcatchment P2: New Roof

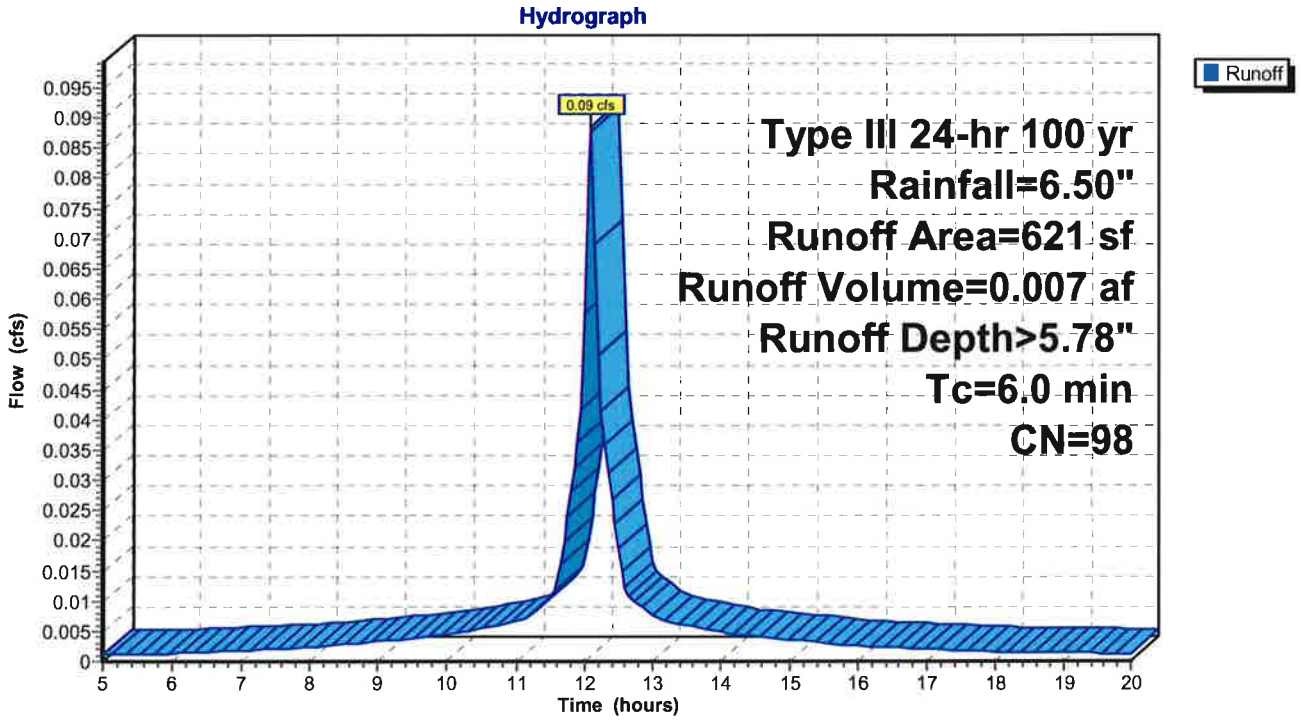
Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.007 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

	Area (sf)	CN	Description
*	621	98	Impervious
	621		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P2: New Roof



Summary for Subcatchment P3: Stair Drain

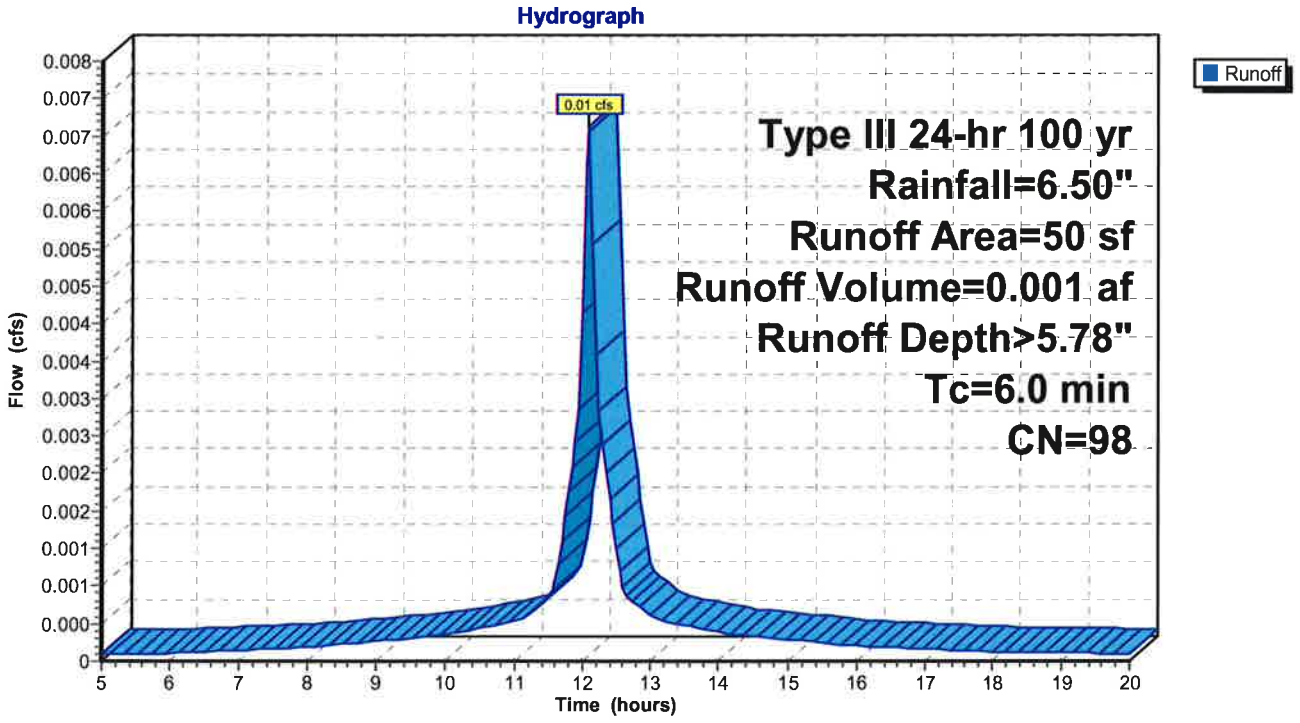
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 0.001 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

	Area (sf)	CN	Description
*	50	98	Impervious
	50		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P3: Stair Drain



Summary for Subcatchment P4: Front Roof and Stair Drain

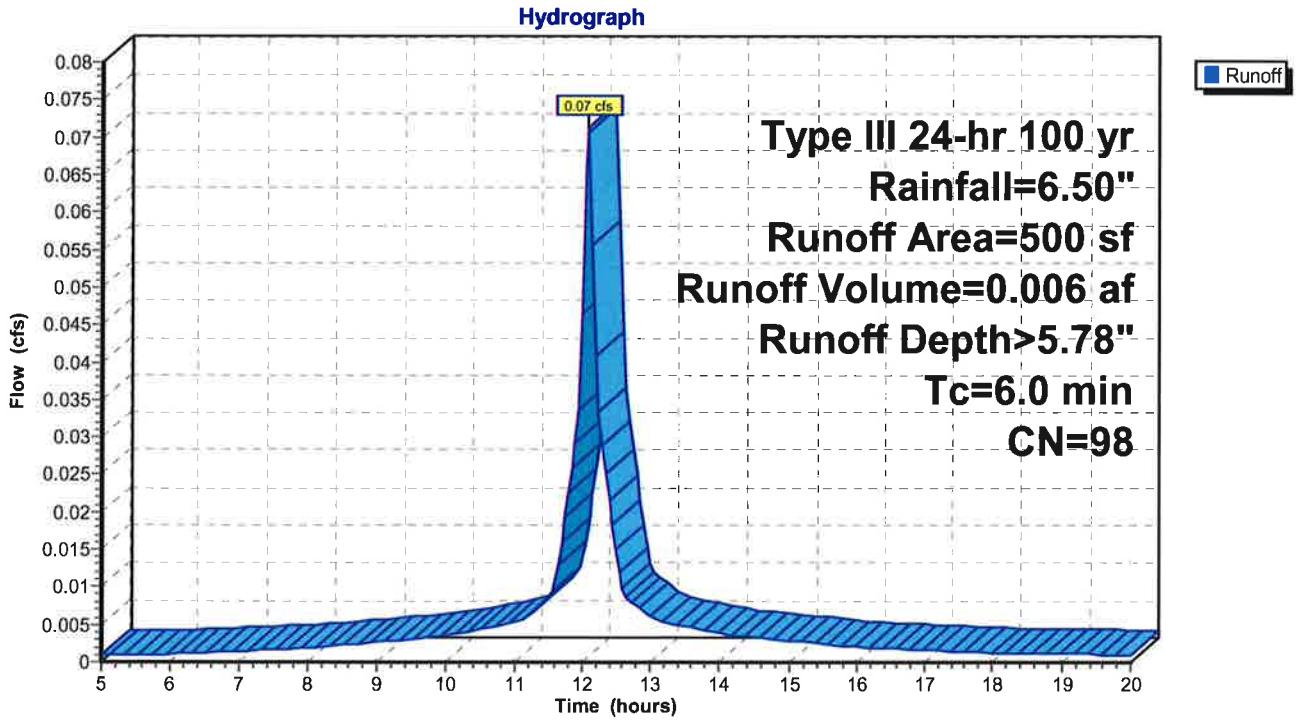
Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

	Area (sf)	CN	Description
*	500	98	Impervious
	500		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment P4: Front Roof and Stair Drain



Summary for Subcatchment PRE: Predevelopment

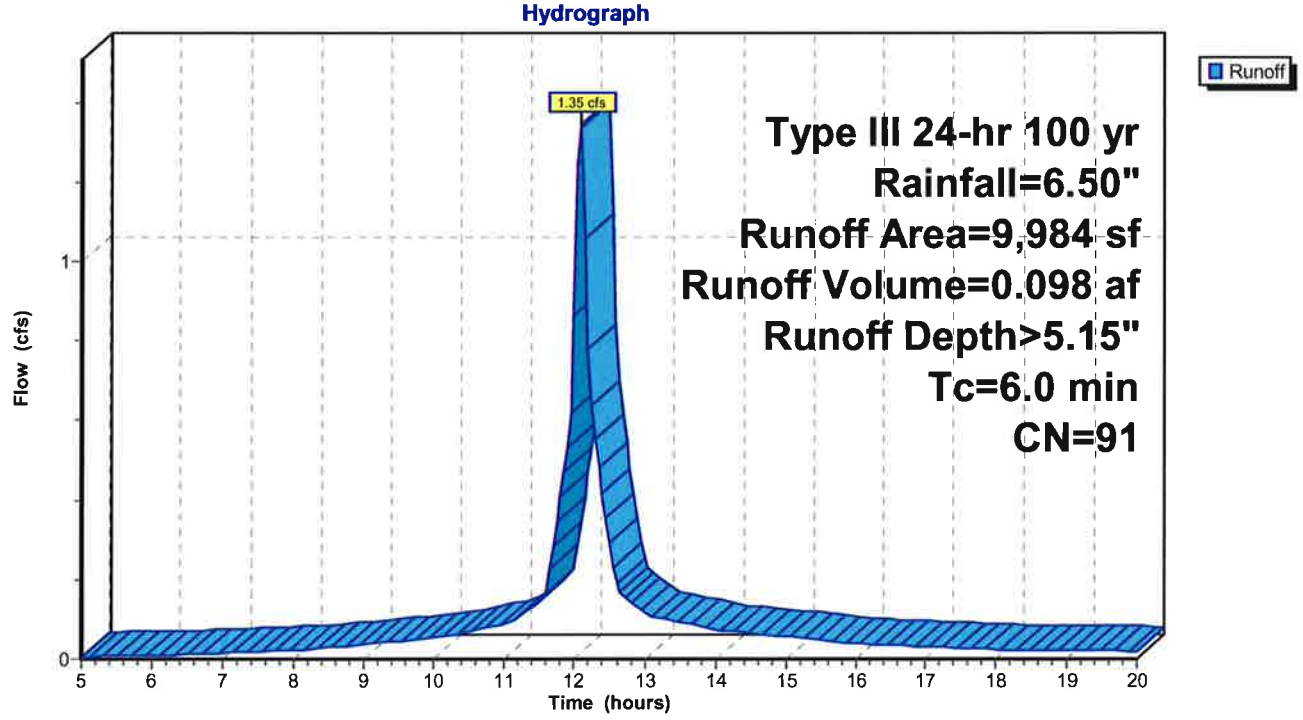
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

	Area (sf)	CN	Description
*	5,967	98	Impervious Area
	4,017	80	>75% Grass cover, Good, HSG D
	9,984	91	Weighted Average
	4,017		40.23% Pervious Area
	5,967		59.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Direct**

Subcatchment PRE: Predevelopment



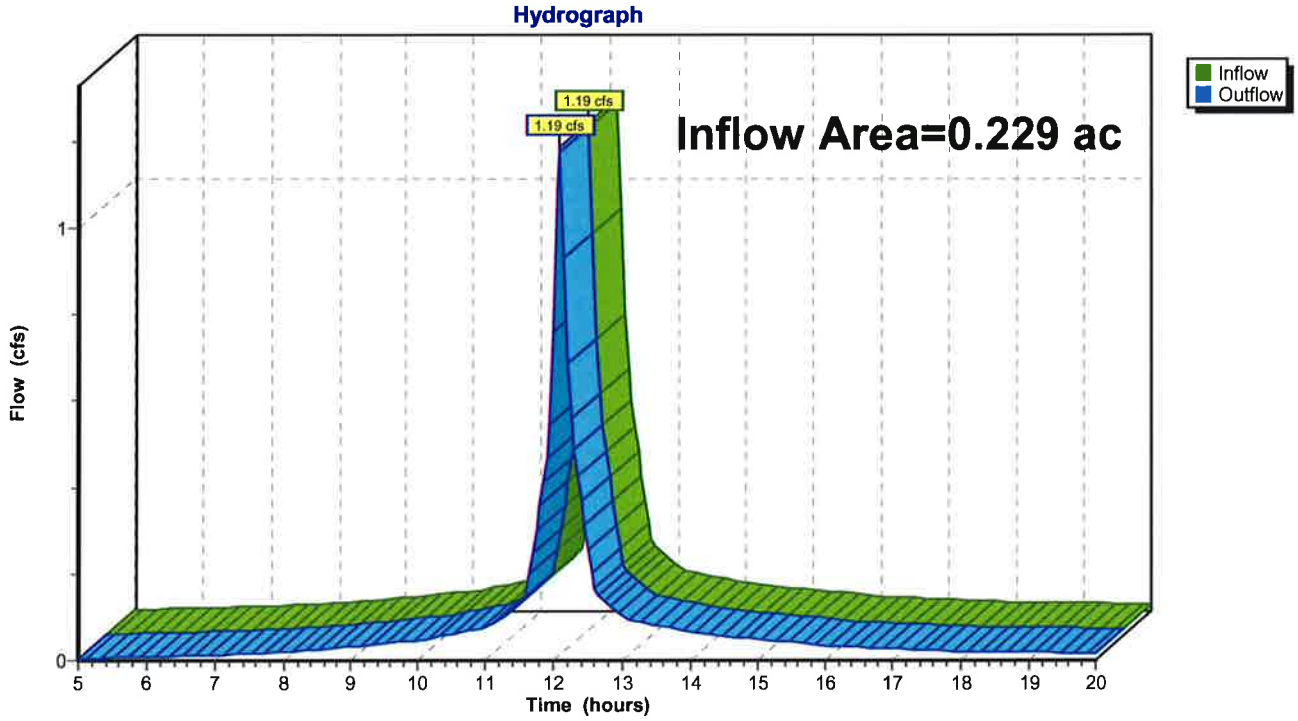
Summary for Reach POST: Total Post Development

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.229 ac, 65.32% Impervious, Inflow Depth > 4.54" for 100 yr event
Inflow = 1.19 cfs @ 12.09 hrs, Volume= 0.087 af
Outflow = 1.19 cfs @ 12.09 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach POST: Total Post Development



Summary for Pond D1: 6' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 182.77'
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.015 ac,100.00% Impervious, Inflow Depth > 5.78" for 100 yr event
Inflow = 0.10 cfs @ 12.09 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 13.85 hrs, Volume= 0.001 af, Atten= 89%, Lag= 105.8 min
Discarded = 0.01 cfs @ 13.85 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 190.77' @ 13.85 hrs Surf.Area= 0.001 ac Storage= 0.006 af

Plug-Flow detention time= 405.7 min calculated for 0.001 af (20% of inflow)
Center-of-Mass det. time= 202.4 min (936.3 - 733.8)

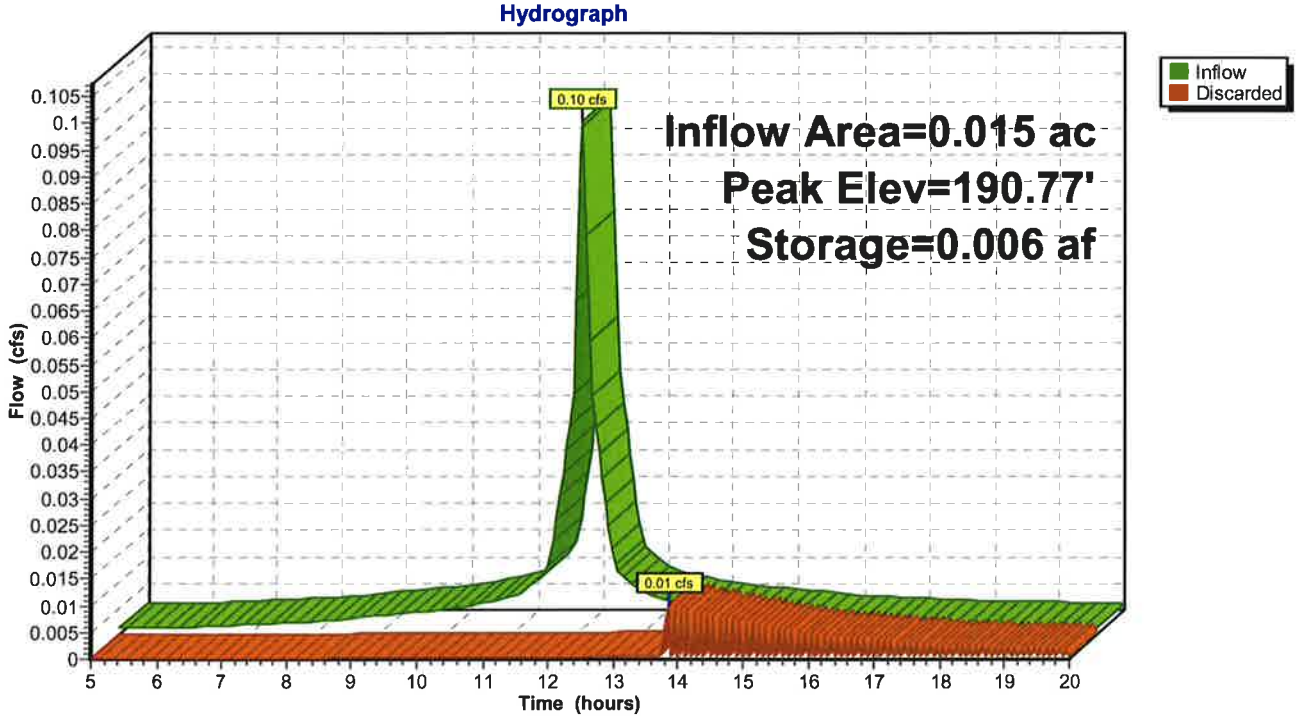
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.004 af	**6.00'D x 6.00'H Drywells** Inside #2 0.005 af Overall - 6.0" Wall Thickness = 0.004 af
#2	-1.00'	0.002 af	**8.00'D x 9.00'H Vertical Cone/Cylinder** 0.010 af Overall - 0.005 af Embedded = 0.005 af x 40.0% Voids
		0.006 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.01 cfs @ 13.85 hrs HW=190.77' (Free Discharge)
1=Exfiltration (Controls 0.01 cfs)

Pond D1: 6' Drywell

Hydrograph



Summary for Pond D2: 4' Drywell

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 3,096.61'
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.011 ac,100.00% Impervious, Inflow Depth > 5.78" for 100 yr event
Inflow = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af
Outflow = 0.09 cfs @ 12.10 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.7 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3,101.61' @ 12.10 hrs Surf.Area= 0.001 ac Storage= 0.002 af

Plug-Flow detention time= 145.9 min calculated for 0.004 af (64% of inflow)
Center-of-Mass det. time= 70.8 min (804.6 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.001 af	**4.00'D x 4.00'H Drywells** Inside #2 0.002 af Overall - 6.0" Wall Thickness = 0.001 af
#2	-1.00'	0.001 af	**6.00'D x 6.00'H Vertical Cone/Cylinder** 0.004 af Overall - 0.002 af Embedded = 0.002 af x 40.0% Voids
		0.002 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	-1.00'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -3.00'

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=3,015.94' (Free Discharge)
1=Exfiltration (Controls 0.09 cfs)

Pond D2: 4' Drywell

Hydrograph